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(54) Title: METHOD AND SYSTEM FOR IDENTIFYING DATA LOCATIONS ASSOCIATED WITH REAL WORLD OBSERVATIONS (54) Titre: PROCÉDE ET SYSTÈME PERMETTANT D'IDENTIFIER DES IMPLANTATIONS DE DONNÉES ASSOCIÉES A DES OBSERVATIONS DU MONDE REEL		
(57) Abstract <p>A method and system for identifying data locations or uniform resource locators associated with physical observations in the real world. The method and system includes selecting certain physical parameters based upon an observation of real world objects and events and associating such physical parameters with data locations on the Internet or other computer network. When the real world object is observed or a real world event occurs, physical parameters relating to the object or event are sensed and recorded. These stored physical parameters are then communicated to a database, which returns a data location corresponding to the observed physical parameters. Thus, the present invention allows a user to "click" on objects or events in the real world in order to find data locations related to the objects or events in the on-line world.</p> (57) Abrégé <p>L'invention concerne un procédé et un système permettant d'identifier des implantations de données ou de localisateurs de ressources universel (URL) associés à des observations physiques du monde réel. Ce procédé et ce système consistent à sélectionner un certain nombre de paramètres physiques en fonction d'une observation d'objets et d'événements du monde réel, et à associer ces paramètres physiques à des implantations de données sur Internet ou sur un autre réseau informatique. Lorsqu'on observe un objet du monde réel, ou lorsqu'un événement survient, les paramètres physiques associés audit objet ou événement sont détectés et enregistrés. Puis les paramètres physiques stockés sont communiqués à une base de données, qui renvoie une implantation de données correspondant aux paramètres physiques observés. Cette invention permet donc à un utilisateur de cliquer sur des objets ou des événement du monde réel, afin de trouver des implantations de données associées aux objets et aux événement dans le monde en ligne.</p>		

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(54) Title: METHOD AND SYSTEM FOR IDENTIFYING DATA LOCATIONS ASSOCIATED WITH REAL WORLD OBSERVATIONS

(57) Abstract

A method and system for identifying data locations or uniform resource locators associated with physical observations in the real world. The method and system includes selecting certain physical parameters based upon an observation of real world objects and events and associating such physical parameters with data locations on the Internet or other computer network. When the real world object is observed or a real world event occurs, physical parameters relating to the object or event are sensed and recorded. These stored physical parameters are then communicated to a database, which returns a data location corresponding to the observed physical parameters. Thus, the present invention allows a user to "click" on objects or events in the real world in order to find data locations related to the objects or events in the on-line world.

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Description

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METHOD AND SYSTEM FOR IDENTIFYING DATA LOCATIONS
ASSOCIATED WITH REAL WORLD OBSERVATIONS

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FIELD OF THE INVENTION

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The present invention relates to a method and system for sensing physical parameters corresponding to an object or event in the physical world and, based on the observed physical parameters, retrieving a data location on a computer network pointing to information associated with the physical world object or

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20 event.

BACKGROUND OF THE INVENTION

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The increasing use of wide area networks such as the Internet has resulted in an explosion in the provision of on-line services. Computer users can access a vast wealth of information and services by utilizing a wide area network to establish a connection with other computers connected to the network.

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The Internet is a global network of millions of computers belonging to various commercial and non-profit entities such as corporations, universities, and research organizations. The computer networks of the Internet are connected by gateways that handle data transfer and conversion of messages from a sending

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5 network to the protocols used by a receiving network. The Internet's collection of
networks and gateways use the TCP/IP protocol. TCP/IP is an acronym for
10 Transport Control Protocol/Internet Protocol, a software protocol developed by the
Department of Defense.

5 Typically, the computers connected to a wide area network such as the
Internet are identified as either servers or clients. A server is a computer that
15 stores files that are available to other computers connected to the network. A
client is a computer connected to the network that accesses the files and other
resources provided by a server. To obtain information from a server, a client
20 computer makes a request for a file or information located on the server using a
specified protocol. Upon receipt of a properly formatted request, the server
downloads the file to the client computer.

25 The World Wide Web is a system of Internet servers using specified
Internet protocols and supporting specially formatted documents. The HyperText
15 Transfer Protocol (HTTP) is the underlying protocol used by the World Wide Web.
HTTP defines how messages are formatted and transmitted, and what actions Web
30 servers and browsers should take in response to various commands. The other
main standard of the World Wide Web is Hyper-Text Markup Language (HTML),
which covers how documents and files are formatted and displayed. HTML
35 supports links to other documents, as well as graphics, audio, and video files.

20 Users access the content contained on the Internet and the World Wide
Web with an Internet Browser, which is a software application used to locate and
40 display web pages. Files on a web server are identified by a uniform resource
locator. A Uniform Resource Locator ("URL") is the global address of files and
25 other resources on the Internet. The address indicates the protocol being used
and specifies the IP address or the domain name where the file or resource is
45 located. Typically, a URL identifies the name of the server and the path to a
desired file on the server. For example, a URL for a web server may be
constructed as follows: "http://<server>/<filepath>", where <server> identifies
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5 the server on which the file is located and <filepath> identifies the path to the file
on the server. Thus, with the name of the server and the correct path to a file, a
10 properly formatted URL accesses a desired file on a server connected to the World
Wide Web.

5 As one can imagine, there are myriad documents and files accessible over
the Internet. However, as discussed above, retrieving desired information on the
15 Internet requires knowledge of an associated URL. Accordingly, if, for example, a
consumer wishes to obtain information about or order a particular company's
product on the World Wide Web, she must know the URL (data location)

20 corresponding to that company's web site. Conversely, if a corporation desires the
public to visit its web site containing information about its products, it will typically
advertise its web site and corresponding URL in television, radio, print or other
25 media. A consumer may then enter this URL, assuming he remembers it, into a
browser and access the web site.

15 When a specific URL or data location is not known, search engines are a
way of locating desired information. Typically, a user enters key words or search
30 terms into a search engine, which returns a list of URLs corresponding to web sites
or USENET groups where the key words or search terms were found. Often a
search engine will return a large list of web sites, through which the user must
35 wade in order to locate the few web sites relevant to his query.

Due in part to the proliferation of commercial web sites, consumers have
become accustomed to the notion that there is a corresponding web site for the
40 vast majority of products and services being commercially offered. Yet, as
described above, access to a particular web site on the Internet, requires
25 knowledge of the actual URL or access to a search engine. This becomes
45 problematic, however, when there is no immediate access to a computer
connected to the Internet. For example, when a radio listener hears a song on the
radio and desires more information about it, he must remember the song title and
50 the artist. Later, the listener can enter the song title or the artist as search terms in

5 a typical search engine. Beyond this method, there are no alternative ways of
identifying data locations or URLs based upon an observation of a particular
10 product or event. In light of the foregoing, it can be seen that a need exists for
alternative methods of identifying URLs or other data locations on a computer
5 network.

SUMMARY OF THE INVENTION

15 The present invention provides a method and system for identifying data
locations or uniform resource locators associated with physical observations in the
real world. The method and system includes selecting certain physical parameters
20 based upon an observation of real world objects and events and associating such
physical parameters with data locations on the Internet or other computer
network. When the real world object is observed or a real world event occurs,
25 physical parameters relating to the object or event are sensed and recorded.
These stored physical parameters are then communicated to a database, which
15 returns a data location corresponding to the observed physical parameters. Thus,
the present invention allows a user to use an appropriate sensing device to merely
30 mark or key in on objects or events in the real world in order to find data locations
related to the objects or events in the on-line world.

35 In a preferred embodiment of the system of the invention, one observed
20 physical parameter is the channel or carrier frequency of a broadcast. The system
includes a means for sensing the channel or carrier frequency of the broadcast. As
set forth in more detail below, the means for identifying may be a remote device
40 or "clicker" that uses a chirp signal to identify the channel or carrier frequency of
the broadcast. The sensing unit may also be a hand-held, laptop, desktop, or
25 other computer programmed to contain a list of available broadcasts that can be
selected by the user. The system further includes a computer database having
45 stored associations between these physical parameters (here, the channel or
frequency of the broadcast) and one or more data locations, uniform resource
locators, or Internet addresses. Thus, when the sensing means identifies and
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5 provides the channel of a broadcast, the computer database selects the
corresponding uniform resource locator, Internet address or other data location.
10 The system thus enables the identification and selection of an Internet address
containing information corresponding to the broadcast, even though neither the
5 broadcast nor the user provides an explicit Internet address.

15 In other preferred embodiments, the sensing means also includes a clock or
other means for identifying the time, so that the physical observation may include
a set of physical parameters including not only the channel of the broadcast, but
also the time of the broadcast. Furthermore, the sensing means may include
20 computer memory or other storage means for storing the channel and time so that
these physical parameters may be provided to the computer database at a later
time. Alternatively, the memory may store the Internet address provided by the
database.

25 One embodiment of the present invention includes a "clicker" or sensing
15 unit for sensing physical parameters associated with the operation of a radio
receiver. In one embodiment, the physical parameters include the frequency to
which the radio receiver is tuned. The clicker includes a transmitter for
30 transmitting a chirp signal to the radio receiver during a chirp transmission time. A
chirp signal is an audio signal modulated at a range of carrier frequencies during a
35 chirp transmission time in a predetermined manner. The carrier frequency of the
chirp signal varies over a range that includes the possible channels to which the
receiver may be tuned. For example, in the FM radio frequency band, the chirp
40 signal may vary from about 88 to 108 megahertz. The clicker also includes a
microphone for receiving the audio output of the radio receiver. When the
25 frequency of the chirp signal enters the range of the broadcast channel to which
the radio receiver is tuned, the radio receiver receives and processes the chirp
45 signal, thereby producing a corresponding output. The chirp receiver detects the
audio output of the radio receiver. The clicker also includes a detector coupled to
the chirp receiver for generating a detector signal when the detector detects the
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5 audio output corresponding to the chirp signal. Accordingly, the frequency of the
chirp signal at which the detector signal is generated identifies the channel or
10 frequency to which the radio receiver is tuned. According to the present
invention, a listener to a radio broadcast on a radio receiver may use the clicker to
5 identify the channel of the broadcast by pressing a button on the clicker to initiate
a chirp signal. The clicker then operates as discussed above to identify the
15 frequency to which the radio receiver is tuned.

In yet other embodiments, the clicker includes the ability to identify and
record other concurrent physical parameters, such as the time when the clicker or
20 chirp signal is activated. For example, the clicker may include a real-time clock
that provides a clock signal corresponding to the time the listener presses the
clicker to initiate the chirp signal. Preferred embodiments of the clicker also
25 include memory to store the channel or frequency of the broadcast and the time
the listener activated the chirp signal, as well as means for transmitting the channel
15 and time to the database of the present invention.

Other embodiments of the clicker for use in connection with a radio
30 receiver include a "passive" sensing mechanism. The clicker of this embodiment
includes a transducer for receiving the output of a radio receiver. The clicker also
includes a first receiver for receiving modulated radio signals and a circuit for
35 20 demodulating the radio signal into a demodulated signal with respect to a range of
frequencies. The clicker further includes a detector for detecting a correlation
between the audio output of the radio as provided by the transducer and the
40 second demodulated signal processed by the demodulating circuit or radio
receiver.

25 One preferred embodiment of the sensing unit of the present invention
utilizes both the active and passive frequency detection techniques discussed
45 above. In one such embodiment, the sensing unit, when activated, first operates
in either the active or passive mode to detect the frequency to which the
monitored broadcast receiver is tuned and employs the alternate mode if no
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5 frequency was detected. Other embodiments of the sensing unit also include the
ability to detect the user's geographic location based on the frequency spectrum
signature of the broadcast band in that region.

10 The database corresponding to the clicker described above may include
5 Internet addresses or other data locations specific to a particular channel or
frequency and a range of times. For example, the listener may become interested
15 in the subject matter of a particular radio advertisement broadcast on a radio
channel. According to the invention, the listener activates the clicker, which
identifies and stores in memory the frequency to which the radio receiver is tuned
20 and the time the clicker was activated. This information is transmitted to the
database, as more fully described below, to identify the Internet address associated
with the observed broadcast frequency and time and, hence, the radio
25 advertisement. Thus, an Internet address associated with the time and channel of
the broadcast may be determined even though access to the Internet is not
15 available at the time of the broadcast and even though no Internet address is
given. Moreover, the device described above allows the listener to essentially
30 perform a search of the Internet without articulating a query and entering it into a
search engine.

35 One skilled in the art will readily recognize that other embodiments of the
20 invention for use in other contexts are possible. For example, the physical
observation may include physical parameters such as geographical location, sound,
voice, image, bar code or other event. Furthermore, the identifying means may
40 include a telephone, television remote control unit, a portable wireless device, or
task bar application on a computer.

25 DESCRIPTION OF THE DRAWINGS

45 Figure 1 is a flow chart diagram illustrating several embodiments of the
present invention for use in the radio broadcast context.

Figure 2 is a functional block diagram of a first preferred sensing unit for
50 identifying the frequency to which a radio receiver is tuned.

5 Figure 3 is a functional block diagram of a second preferred sensing unit for identifying the frequency to which a radio receiver is tuned.

10 Figure 4 is a front plan view of a hand-held computer which has been configured according to the present invention.

5 Figure 5 is a flow chart diagram illustrating the general process steps performed by a first preferred server of the present invention as applied to the radio broadcasting context.

15 Figure 6 is a functional block diagram illustrating an embodiment of the system of the present invention.

20 Figure 7 illustrates a third preferred sensing unit for identifying the frequency to which a radio receiver is tuned.

25 Figure 8 is a functional block diagram of a fourth preferred sensing unit for identifying the frequency to which a radio receiver is tuned.

30 Figure 9 is a functional block diagram illustrating an embodiment of the audio matching circuit for use in the fourth preferred embodiment of the present invention.

35 Figure 10 is a flow chart setting forth a method for storing physical parameter data according to one embodiment of the present invention.

40 Figure 11 is a flow chart diagram illustrating a method for receiving physical parameter data that includes running time intervals.

45 Figure 12 is a flow chart diagram providing a method for resolving activation times in real-time from physical parameter data including running time intervals.

DETAILED DESCRIPTION OF THE INVENTION

50 As discussed above, the present invention provides methods and apparatuses for identifying a data location based upon physical observations in the real world. The method and system generally include identifying one or more physical parameters corresponding to physical observations of real world objects or events and associating such physical parameters with data locations. Another

5 aspect of the present invention identifies data locations based upon physical
observations. The method of this aspect of the present invention generally
10 comprises sensing physical parameters associated with physical objects or events
and transmitting the observed physical parameters to a database, which includes
5 associations between these physical parameters and one or more data locations.

The present invention is applicable to the radio broadcast context.
15 According to the invention, a radio listener is provided with a frequency sensing
unit, which the listener activates when he/she hears a song or advertisement that is
of interest. The sensing unit observes the frequency to which the radio is tuned.
20 In preferred form, the sensing unit also observes the time the listener activated the
sensing unit. The sensing unit is then operably connected to a database server of
the present invention such that it transmits the observed physical parameters for
25 identification of a data location or URL.

The database according to this embodiment of the present invention
15 includes a list of data locations or URLs which relate to certain radio broadcasts.
These data locations or URLs, for example, may point to the web site of a
30 recording artist or a record label. The data location may also point to the web site
of a corporation that advertises over a particular radio station. Associated with
each of these data locations are the physical parameters of broadcast frequency
35 and time. More specifically, the database of the present invention is arranged
such that certain physical parameters or ranges of physical parameters correspond
40 to each data location. For example, a particular data location pointing to a
recording artist will have associated with it the frequency of the radio broadcast
and the time(s) during which one or more of his songs was played. Therefore,
25 when a listener hears that recording artist or song on the radio and desires more
information relating to it, he simply activates the sensing unit. The sensing unit
45 senses and stores the frequency of the broadcast and time of activation. This
information is transmitted to the database of the present invention, which
50 identifies a data location and transmits the data location to the listener. In this

5 manner, the listener has gathered physical parameters from the real world off-line
and subsequently used the physical parameters to search for information
10 corresponding to these physical parameters on the Internet. Furthermore, unlike
prior art search engines, the listener has performed a search without ever
5 articulating any search terms. Additionally, the search terms used by the listener
comprised physical parameters (time and frequency, in this circumstance)
15 corresponding to the occurrence of a song in the real world. Such search terms
would be meaningless to prior art searching techniques and systems.

In one preferred embodiment, the database is arranged into a series of
20 records each having four fields. The four fields include 1) the radio station or
broadcast frequency, 2) the name of the song or advertisement, 3) the start time of
the song or advertisement, and 4) the artist or entity associated with the song or
25 advertisement and a data location. Other preferred databases include a fifth field
designating the type of item stored in the record, *i.e.*, whether the record
15 represented a song or an advertisement. In a preferred form, the records of the
database are arranged such that the record with the latest start time value with
respect to each broadcast frequency is scanned first. Therefore, as illustrated in
30 Figure 5, when the server is presented with a broadcast frequency/radio station
and a time, it scans the database for the most recent record whose frequency/radio
station matches the query and whose start time is anterior to the time presented by
35 the query. If the server finds a record matching the user's query, it returns at least
one data location or URL associated with these physical parameters.

40 Delivery of the data locations can be accomplished in a variety of ways.
The data locations can be delivered via e-mail, fax, or even regular mail or phone.
25 The data location may also be delivered as part of a HTML document and
accessed by the user's Internet browser. The data location may also be delivered
45 as an Internet browser bookmark. The data location may further be stored in a
user-specific account file on a server connected to the Internet. A user may access

5 the account using an Internet browser and click on the data location to access the
corresponding web site.

10 The sensing unit for use in the radio broadcasting example described above
may comprise any suitable unit for recording a frequency and an activation time.

- 5 Figure 1 illustrates some of the methods and systems for capturing physical
parameters associated with radio broadcasts and identifying associated data
15 locations. As more fully described below, the sensing unit could observe the
frequency to which the listener's radio is tuned. In other embodiments, the
sensing unit is a hand-held computer programmed to display a listener's favorite
20 radio stations. When the listener hears something that is of interest, he simply taps
the screen on the icon representing the radio station to which he is listening. The
sensing unit is also incorporated into a general purpose computer as a task bar
25 application. The present invention also contemplates the use of a telephone as a
sensing unit.

15 A. User Access to Database

- In one embodiment, users access physical parameter/data location
30 database 54 according to the present invention by accessing server 52 of data
location site 50 via client computers 60. In one embodiment, computer network
40 is the Internet; however, computer network 40 can be any suitable local or
35 wide area computer network. In addition, computer network 40 can be an
electronic, optical or wireless network. In the embodiment shown in Figure 6,
data location site comprises server 52 operably connected to computer network
40. Server 52, in one embodiment, is a web server that receives requests from
users and transmits data in return. Data location site 50, in one embodiment,
25 further comprises physical parameter/data location database 54 and user account
database 56.

45 1. User Accounts

- a. Unique User ID for log in

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5 In one embodiment, users of the system each have an account identified
by a unique user identification. In one form, users access accounts stored in user
10 account database 56 operably connected to computer network 40 via server 52.
In one embodiment, user account database 56 stores unique user identifications
5 and a password for each user of the system.

15 In one embodiment, users access data location site 50 via client computers
60. In one embodiment, browser 62 on client computer 60 includes a browser
plug-in or ActiveX component that establishes the communications link to data
20 location site 50. In one embodiment, users log in to data location site 50 by
transmitting a user identification and physical parameter data. In one
embodiment, users log in to data location site 50 by transmitting physical
25 parameter stored on sensing unit 70 to data location site 50. In one embodiment,
the sensing units according to the present invention store and transmit the user's
unique identification to data location site 50 along with physical parameter data
15 via client computer 60. In another embodiment, sensing unit 70 stores and
transmits a unique sensing unit identification or serial number instead of the user's
30 identification. According to this embodiment, user account database 56 stores the
sensing unit identification in association with the account identification
corresponding to the user of the sensing unit. In this form, server 52 identifies the
35 20 user by retrieving the account identification corresponding to the transmitted
sensing unit identification from user account database 56.

40 The connection between sensing unit 70 and computer 60 can be a
physical connection or a wireless connection. In one embodiment, sensing unit 70
physically connects to client computer 60 via a serial or parallel port. In another
25 embodiment, sensing unit 70 includes an infrared transmitter which transmits data
to client computer 60 equipped with its own infrared detector. Of course, any
45 other suitable wireless communication method can be used.

50 In another embodiment, sensing unit 70 directly accesses data location site
50. For example and in one embodiment, sensing unit 70 includes a Dual Tone

5 Multiple Frequency (DTMF) generator allowing for transmission of user
identifications and physical parameter data over telephone lines. In one form,
10 sensing unit 70 further stores the phone number corresponding to data location
site 50 and, when activated, emits the DTMF tones corresponding to the phone
5 number to establish a connection with data location site 50. When a connection
is established, sensing unit 70 transmits a user identification and observed physical
15 parameter data.

b. Monitoring Agent

As discussed above, observed physical parameter data is transmitted and
20 10 used to retrieve a corresponding data location, if any. In one embodiment, when
a user transmits physical parameter data, server 52 accesses database 54 to
retrieve a data location and transmits the data location associated with the physical
25 parameter data to the user. In one embodiment, data location site 50 provides the
user the option to save the data location. In one embodiment, the data location is
15 saved as a bookmark and stored locally on client computer 60. In another
embodiment, the data location is stored in user account database 56 in association
30 with the user's account identification. Thereafter, a user gains access to the stored
data locations by accessing his or her account.

In another embodiment, data location site 50 includes a monitoring agent
35 20 that searches for additional data locations based on the data locations stored by
the user. In one form, these additional data locations are presented to the user at
a subsequent log-in. In another embodiment, the monitoring agent filters data
40 transmitted to it and stores data locations that may be of interest to the user based
on the data locations stored in the user's account. For example and in one
25 embodiment, the monitoring agent is configured to receive lists of data locations
corresponding to concert events. In one form, the monitoring agent filters the list
45 against the data locations stored in a user account (bookmarks) and saves those
data locations in the user account that correspond or relate to those bookmarks.

2. Encryption of Physical Parameter Data

5 In one embodiment, data transmitted to data location site 50 is encrypted.
In one embodiment, sensing unit 70 encrypts physical parameter data and stores
such data in memory. In one embodiment, sensing unit 70 encrypts the data with
10 a unique key comprising a string of random bits. As discussed above, the
5 encrypted physical parameter data is transmitted with the user's account
identification to data location site 50. In one form, user account database 56
15 stores the encryption key of each sensing unit in association with the user's account
identification and/or the sensing unit identification. Accordingly, data location site
50 can use the associated encryption key to decrypt the physical parameter data
20 and retrieve corresponding data locations.

B. Physical Parameter Sensing Units

1. Active Frequency Detection

25 In some preferred embodiments, the sensing unit itself captures the
frequency of the broadcast. More specifically and in one preferred embodiment,
15 the sensing unit, when activated, emits a chirp signal over a range of frequencies
and monitors the output of the radio receiver to detect the frequency to which the
30 radio receiver is tuned. As shown in Figure 2, a first preferred sensing unit 10
generally comprises microcontroller 12, frequency synthesizer 14, real-time clock
16, activation button 18, and microphone 20. Sensing unit 10 further includes a
35 suitable power unit, such as a battery (not shown).
20

Microcontroller 12 includes frequency bus 22 and signal bus 24, both of
which connect to frequency synthesizer 14. Microcontroller 12 sends a carrier
40 frequency over frequency bus 22 and a chirp signal over signal bus 24 to
frequency synthesizer 14. As is conventional in the art, frequency synthesizer 14
25 emits a chirp signal over the carrier frequency specified by microcontroller 12.
Frequency synthesizer 14 can be any tunable modulator known in the art. In the
45 first preferred embodiment, sensing unit 10 works in conjunction with a
conventional FM radio receiver. Accordingly, frequency synthesizer 14 is a
tunable frequency modulator.
50

5 As alluded to above, sensing unit 10 emits a chirp signal over a range of frequencies to detect the frequency to which the listener's radio is tuned. In a preferred form, the listener activates sensing unit 10 by depressing button 18. In
10 one embodiment, microcontroller 12 stores in memory the time value from real-time clock 16. Microcontroller 12 then starts at the lowest carrier frequency in the FM radio band (about 88 megahertz) and directs frequency synthesizer 14 to emit
15 a chirp signal. Microcontroller 12 is then programmed to wait for a pre-determined amount of time. If the listener's radio 30 is tuned to this frequency, its audio output will correspond to the chirp signal. Microphone 20 senses the audio
20 output of radio 30 thereby allowing microcontroller 12 to detect a correspondence between the audio output of radio 30 and the chirp signal. If, after the pre-determined amount of time, microcontroller 12 detects no correlation,
25 microcontroller steps the carrier frequency up to the next possible carrier frequency according to the frequency spacing of the particular radio band and
15 directs frequency synthesizer 14 to emit another chirp signal. This process is repeated until microcontroller 12 detects the chirp signal in the audio output of
30 radio 30. When a correlation is detected, microcontroller 12 stores the corresponding carrier frequency in association with the stored time value in memory.

35 20 The chirp signal may comprise any suitable signal. In the radio context, the frequency of the chirp signal is limited by the bandwidth of each channel. In preferred form, the chirp signal is a tone having a primary frequency between
40 about 400 to 3000 Hz. The tone is preferably pleasing to the ear as it is within the audible range. The duration of the chirp signal, in one preferred embodiment, is
25 about 10 milliseconds. In addition, microcontroller 12 is programmed with a delay of a 10 millisecond delay to allow for recognition of the chirp signal in the audio output of the radio. Of course, the chirp signal duration and delay between
45 chirp signals provided above are merely examples and are only limited by the constraints of the hardware and software being used, and the propagation time
50

5 required for the audio output of radio 30 to reach microphone 20. In one
embodiment, the delays may be configured such that sensing unit 10 is already
10 transmitting the chirp signal on another carrier frequency, when the sound of the
chirp signal (demodulated and output by the radio receiver) is still traveling
5 through the air to the microphone 20 and actually detected by sensing unit 10. In
one embodiment, when the chirp signal is detected, microcontroller 12 steps back
15 slowly (in one embodiment, by delaying longer between chirp signal transmissions)
through the previous carrier frequencies to confirm the "hit" and precisely validates
the carrier frequency. Furthermore, in the case of sensing a frequency in the FM
20 band, the strength or power of the chirp signal emitted from sensing unit 10 must
be sufficient to "overpower" the radio signal of the broadcast station to which the
FM receiver is tuned.

25 In addition, microcontroller 12 can be programmed to reduce the time
during which it seeks for the desired frequency. In one embodiment,
15 microcontroller 12 is programmed to store the carrier frequency of the listener's
favorite radio stations and to start with these frequencies before stepping through
30 the entire frequency band. In other embodiments, sensing unit takes advantage of
the side bands in the power spectra of the chirp signal. In this embodiment,
microcontroller 12 begins with the next-to-lowest frequency in the radio band and
35 20 steps through every two possible carrier frequencies. Of course, the power spectra
of the chirp signal must have sufficient power in the sidebands to overpower the
radio broadcast signal. If microcontroller detects a correspondence between the
40 audio output of radio 30 and the chirp signal, it steps the carrier frequency down
or up to seek a stronger radio output signal.

25 Sensing unit 10 also includes a means for transmitting stored physical
parameters to a user's computer or directly to the server of the present invention.
45 Figure 6 illustrates the system of the present invention where stored physical
parameters are transmitted to a client computer connected to the Internet. The
client computer accesses the server of the present invention and transmits a data
50

5 location request. In the first preferred embodiment, sensing unit 10 includes
speaker 26 for transmitting the stored physical parameters to the listener's
10 computer. Microcontroller 12 is programmed to distinguish between a short
depression of button 18 and a long depression. A short depression of button 18
5 causes activation of sensing unit 10 to detect and store a frequency and activation
time as described above. A long depression of button 18 causes transmission of
15 stored physical parameters through speaker 26. The microphone input of the
listener's computer receives the audio output of microphone 26. The listener's
computer is programmed to store the data and to access the database of the
20 present invention to identify a data location or URL that corresponds to the
observed physical parameters. Of course, any suitable data transmission means
could be used, including but not limited to infrared devices and hard-wired
25 connections.

The listener's computer can be any conventional personal computer known
15 in the art. In one preferred embodiment, the listener's computer is connected to
the Internet via a dial-up connection or through a network line. Such
30 communication could also be wireless. The listener's computer is further
programmed, as discussed above, to receive at a standard microphone input the
audio signal emitted by the sensing unit 10 and to transmit these observed physical
35 parameters to the database of the present invention. In other embodiments, the
listener's computer is configured to receive physical parameter data through other
input/output ports, such as audio line in, microphone in, USB port, serial port or
40 parallel port. In other preferred embodiments, the database of the present
invention is not connected to the Internet. In one embodiment, the protocol for
25 audio communication of physical parameter data between the sensing unit and the
listener's computer is RS 232. In one embodiment, the listener's computer includes
45 appropriate communications software and a modem to access the database. In
either of these embodiments, the listener's computer may also be configured to

5 transmit a user identification number and password before access to the database is permitted.

10 Sensing unit 10 can also communicate directly to the database of the present invention. In this embodiment, the listener directly dials the server and,
5 when prompted, depresses button 18 to transmit the stored physical parameters to the server through speaker 26 to the microphone in the telephone handset. In this
15 embodiment, sensing unit 10 could also be configured to transmit a user identification number and password along with the stored physical parameters. Upon verification of the user's identification and password, the server uses the
20 stored physical parameters to search the database for associated data locations or URLs. The server can then send any identified data locations to the user's e-mail account or back to the sensing unit.

25 Sensing unit 10 can be incorporated into a variety of devices. For example, sensing unit 10 comprises a stand-alone unit and is small enough to be used as a
15 key chain similar to keyless remote systems for automobiles. Sensing unit 10 can also be incorporated as an additional feature of a common hand-held or other
30 portable computer.

In addition, Figure 7 shows another embodiment of the sensing unit of the present invention. The embodiment of Figure 7 transmits a chirp signal to the
35 listener's radio receiver as in the first preferred embodiment, but includes different frequency modulation means. In one embodiment, the sensing unit comprises microcontroller 312, real-time clock 314, low-pass filter 316, multiplier 318,
40 amplifier 320 and oscillator 322. Real-time clock 314 keeps accurate track of time based on the oscillation of a 32.567 KHz quartz, as is conventional in the art.

25 Oscillator 322, in one embodiment, is an outside resistor-capacitor circuit, that generates a clock signal for microcontroller 312, as is standard in the art. However, unlike prior art devices, the reference voltage for oscillator 322 is the
45 output of low-pass filter 316, which filters a pulse-width modulated signal from microcontroller 312 to extract the average voltage of the signal over its period.
50

5 Accordingly, a signal having a larger duty cycle yields a higher output voltage from
low-pass filter 316. Therefore, as one skilled in the art will recognize, the
10 frequency of the clock signal provided to microcontroller 312 depends upon the
duty cycle of the signal from microcontroller 312.

5 The signal output from oscillator 322 is also provided to multiplier 318,
which multiplies the frequency of the signal to achieve the desired result. In one
15 embodiment, oscillator 322 is configured to run at a predetermined range of
frequencies including 4 megahertz. Therefore, if the oscillator output frequency is
4 megahertz, for example, 25-times frequency multiplication achieves a signal
20 having a frequency of about 100 megahertz, which lies within the FM radio band.
Of course, different frequencies are achieved by varying the output frequency of
oscillator 322. As one skilled in the art will recognize, other clock speed and
frequency multiplication parameters can be applied. In one embodiment, this
25 multiplication occurs in two stages of 5-times multiplication to reduce the
constraints and costs of the filters used for multiplication. Each multiplication stage
15 involves filtering for the fifth harmonic of the signal. In one embodiment, a
Schmitt trigger is used to condition the signal output of oscillator 322 and achieve
a signal having a square waveform in order to maximize the power in the
30 harmonics of the signal. The fifth harmonic of the square wave signal is filtered in
a first multiplication stage. In the second multiplication stage, a second filter
35 isolates the fifth harmonic of the waveform resulting from the first multiplication to
achieve the desired frequency multiplication.

40 Amplifier 320 amplifies this frequency-multiplied signal and transmits it to
the listener's radio. Thus, similar to that described above, the duty cycle of the
25 signal provided by microcontroller 312 to low-pass filter 316 also controls the
frequency of the signal ultimately transmitted to the listener's radio receiver. For
45 each carrier frequency there exists a corresponding pulse width or duty cycle.
Accordingly, to transmit a chirp signal (e.g., a 400-Hz tone) over a particular
carrier frequency, microcontroller 312 modulates the pulse-width or duty cycle of
50

5 the signal corresponding to a particular carrier frequency according to the 400 Hz chirp signal.

10 Additionally, identifying the exact speed of microcontroller 312 requires certain calibration steps. This involves running a program and timing it using real-
5 time clock 314. Real-time clock 314 interrupts the program after a specified amount of time (1 second for example). The speed of the processor is derived by
15 counting how many instructions the processor executed in the specified time. In one embodiment, this count is simplified by using a program whose sole function is to increment a counter. This processor speed is then multiplied as appropriate
20 to yield the resulting carrier frequency. In one preferred embodiment, the ratio of the frequency of oscillator 322 to the internal clock speed of microcontroller 312 is 1:4. Therefore, the processor speed is divided by four and multiplied by
25 twenty-five to yield the resulting carrier frequency. The device is calibrated by running the processor at a low speed (88 megahertz / 25, for example) and a
15 relatively high speed (108 megahertz / 25) and then comparing the observed frequencies with the intended frequencies.

30 Other than as set forth above, the above-described embodiment operates much like the first preferred embodiment. Depression of button 334 activates microcontroller 312 which then outputs a pulse-width modulated signal
35 corresponding to the lowest carrier frequency in the FM radio band. Microcontroller 312 monitors the output of the listener's radio through microphone 332. If the chirp signal is detected, the carrier frequency of the chirp signal is
40 measured by timing the processor execution speed as described above. The corresponding frequency and time of activation are then stored in memory. These
25 stored physical parameters are transmitted to the listener's computer through speaker 330, as with the first preferred embodiment. If the chirp signal is not
45 detected, microcontroller 312 increases the pulse-width of the signal provided to low-pass filter 316 such that the signal corresponds to the next possible carrier

5 frequency. This process described above is repeated until the chirp signal is detected in the audio output of the listener's radio.

10 2. Passive Frequency Detection

Figure 3 illustrates a second embodiment of a frequency sensing unit of the present invention. The second preferred sensing unit, rather than emitting a chirp signal, demodulates radio signals with respect to a range of frequencies and compares the demodulated signal to the observed audio output of the radio receiver. As Figure 3 shows, sensing unit 110 generally comprises microcontroller 112, receiver 114, real-time clock 116, activation button 118, and microphone 120.

As described above, when the listener desires more information relating to a particular broadcast, she presses activation button 118 to energize sensing unit 110. Microcontroller 112 through data bus 122 tunes receiver 114 to the lowest carrier frequency in the FM band. Receiver 114 delivers the demodulated signal to microcontroller 112. Microcontroller 112 detects the correlation, if any, between the audio output of radio 130 as captured by microphone 120 and the demodulated signal delivered by receiver 114. If no correlation is detected, microcontroller 112 tunes receiver 114 to the next available carrier frequency and compares the demodulated signal to the audio output of radio 130. This process is repeated until microcontroller 112 detects the requisite correlation. When the correlation is detected, microcontroller 112 stores the frequency at which the correlation was detected and the time, as provided by real-time clock 116, such correlation was detected. This information is then communicated to the listener's computer through speaker 126 as discussed above.

25 3. Combination of Active and Passive Frequency Detection

One embodiment of the frequency sensing unit according to the present invention combines the active and passive frequency detection techniques discussed above. It has been found that when a broadcast signal is weak (e.g., because the user is far away from the broadcast transmitter), the passive frequency

5 detection unit, in some embodiments, does not adequately pick up the broadcast
signal for purposes of audio matching (*i.e.*, comparing the audio signal detected by
10 receiver 114 of sensing unit 110 to the audio output of the monitored receiver as
detected by microphone 120 (see Figure 3)). In addition, when the broadcast
5 signal is strong, the active frequency detection unit (see Figure 2), due to FCC
regulations, cannot output a chirp signal of sufficient strength to overpower the
15 program broadcast signal. Therefore, in some embodiments, a combination of the
active and passive units is required to ensure that the target frequency is detected.

Figure 8 is a functional block diagram illustrating an embodiment of the
20 sensing unit that includes both active and passive frequency detection. As Figure 8
shows, sensing unit 410 comprises microcontroller 412 operably connected to
integrated circuit 413 and timing device 416. Integrated circuit 413 includes
25 transmitter 414, receiver 415, audio matching circuit 442, chirp signal detector
444, chirp signal generator 446, control logic 450, and interface 454. The division
15 of functionality, illustrated Figure 8, among the integrated circuit 413,
microcontroller 412, and the remaining components of sensing unit 410 is not
30 required by any constraint and is provided to illustrate the operation and principles
of the present invention.

As described above, a user activates sensing unit 410 by pressing button
35 418, which via control logic 450 powers up microcontroller 412. Upon such
activation by a user, sensing unit 410 uses both active and passive frequency
detection. In one embodiment, sensing unit 410 first stores a time value (see
40 below) and then employs active frequency detection to determine the frequency
to which a monitored broadcast receiver is tuned. If no frequency is detected in
25 the active mode, sensing unit 410 sweeps the frequency spectrum in the passive
mode described below. In one embodiment, sensing unit 410 is configured to
45 store a plurality of carrier frequencies (usually the user's favorite or most-listened-to
broadcast stations) and to start with these frequencies to detect a match before
stepping through the entire frequency band in either the active or passive modes.
50

5 Other variations are possible. For example, sensing unit 410 could employ passive frequency detection before relying on active frequency detection.

10 In one embodiment, sensing unit 410 includes two antennas (not shown) one of which is dedicated to signal transmission, while the other is dedicated to
5 signal reception. In one embodiment, sensing unit includes a loop antenna for transmission, allowing for high transmission power accuracy and a dipole receive
15 antenna which becomes more sensitive as the user holds the sensing unit (*i.e.*, the user body's capacitance adds up with the antenna.)

20 a. Active Frequency Detection

In the embodiment of Figure 8, active frequency detection operates similarly to the active frequency detection embodiment discussed above.

25 Microcontroller 412 controls operation of transmitter 414 and chirp signal generator 446 to transmit a chirp signal to a monitored broadcast receiver. In one
15 embodiment, chirp signal generator 446 transmits a chirp signal to transmitter 414. Microcontroller 412, in one embodiment, specifies the carrier frequency over
30 which sensing unit 410 emits the chirp signal. Transmitter 414 modulates the carrier signal, specified by microcontroller 412, according to the chirp signal supplied by chirp signal generator 446. Sensing unit 410 broadcasts the
35 modulated signal through antenna 430 via matching circuit 435, and
20 transmit/receive switch 437, and band-pass filter 432. In one embodiment, chirp signal generator 446 is a Dual Tone Multiple Frequency (DTMF) generator that
40 emits DTMF signals via transmitter 414 and antenna 430.

25 As described above, assuming the broadcast chirp signal has sufficient strength to overpower the broadcast signal to which the monitored receiver is
45 tuned, the broadcast receiver demodulates the chirp signal and emits the broadcast chirp signal through a speaker. In one embodiment, sensing unit 410 is configured to delay for a predetermined amount of time in order to detect the
50 chirp signal in the audio output of the broadcast receiver. Specifically, and in one

embodiment, microphone 420 transduces the audio output of the monitored broadcast receiver, which allows chirp signal detector 444 to detect the chirp signal in the audio output. In one embodiment, chirp signal detector 446 is a DTMF signal detector. In one embodiment, a programmable gain control (PGC) circuit 438 amplifies the signal from microphone 420 to ensure an adequate signal level for detection of the chirp signal. If the chirp signal is detected, microcontroller 412 stores the corresponding frequency in association with a time value from timing device 416. The stored physical parameter data can be stored in memory integral to microcontroller 412 or, in another embodiment, in register bank 452. If the chirp signal is not detected, microcontroller 412 specifies another frequency and the process is repeated.

In one embodiment, sensing unit 410 adjusts the power of the chirp signal to a point just sufficient to overpower the broadcast signal to which the monitored receiver is tuned. In one embodiment, programmable gain control (PGC) circuit 439 ensures that the signal level going to receiver 415 is constant. In this form, microcontroller 412 monitors the gain value of PGC circuit 439 and uses the gain value to control the power of the chirp signal transmitted by transmitter 414.

As described above, microcontroller 412 steps through frequencies in the broadcast band until a match, if any, is detected. In one embodiment, microcontroller 412 attempts to detect a match on one to a plurality of preset broadcast frequencies. If no match is found, microcontroller 412 steps through all possible carrier frequencies in the broadcast band.

b. Passive Frequency Detection

In the embodiment of Figure 8, the passive frequency detection mode in sensing unit 410 operates similarly to the passive frequency sensing unit discussed above. In one embodiment, microcontroller 412 specifies a carrier frequency to receiver 415, which demodulates the broadcast signal. Simultaneously, microphone 420 transduces the audio output of the monitored broadcast receiver. In one embodiment, PGC circuit 438 ensures a uniform signal level of the resulting

5 signal. According to the embodiment shown, audio matching circuit 442 detects
the correlation between the demodulated signal from receiver 415 and the audio
10 output transduced by microphone 420. If audio matching circuit detects a
sufficient correlation, microcontroller 412 stores the detected frequency and a
5 time value from timing device 416. Otherwise, microcontroller 412 specifies a
different carrier frequency. This process is repeated until either a sufficient
15 correlation is detected or all possible carrier frequencies are exhausted.

Several techniques can be used to match the demodulated signal from
receiver 415 and the audio output signal transduced by microphone 420. Such
20 techniques include, but are not limited to, (1) using Fast Fourier Transforms to
compare the respective frequency spectrums of the signals, and (2) audio
correlation methods in the time domain. One embodiment of sensing unit 410
takes advantage of a combination of frequency and time domain analysis to detect
25 the correlation between the demodulated signal and the transduced audio output.
Figure 9 illustrates an audio matching circuit 442 configured according to this
embodiment. Audio matching circuit 442, in this embodiment, comprises RMS
30 filters 462, 463, 464, and 465, sample and hold circuit 466, analog multiplexer
468, analog-to-digital (A/D) converter 470, and register 472. The respective
signals from receiver 415 and microphone 420/PGC circuit 438 (see Figure 8) are
35 filtered by RMS filters 462, 463, 464 and 465 to yield the power in each
respective frequency band or "bin", which is determined by the central frequency
and band of each band pass filter 462a, 463a, 464a and 465a. In one
40 embodiment, RMS filter 462, for example, comprises band pass filter 462a, True
RMS filter 462b, and low pass filter 462c. The number of RMS filters, however,
25 merely depends on the amount of information required to correlate the signals.
Accordingly, fewer or more RMS filters than that shown in Figure 9 may be used.
45 In the FM radio broadcasting context, the frequency spectrum of the signals from
receiver 415 and microphone 420 typically ranges from about 50-3000 Hz (the
audio band). Accordingly, in some embodiments, the central frequency of each

band pass filter 462a, 463a, 464a and 465a lies between 10-3000 Hz. In some embodiments, the frequency range of the band pass filters can range from $\pm 1\%$ to $\pm 100\%$ of the audio band.

In one embodiment, sample and hold circuit 466 samples the analog values (i.e., the power in each band or "bin") of the respective signals from each RMS filter 462-465 and holds these values until A/D converter 470 has digitized them. Specifically and in one embodiment, starting at a first analog value, A/D converter 470 via analog multiplexer 468 digitizes the analog signal. The digital value of the signal is then held in register 472. Microcontroller 412 via digital interface 454 retrieves the digital value from register 472, causing the next analog value to be digitized by A/D converter 470. In one embodiment, this process is repeated until all analog signal values held by sample and hold circuit 466 are digitized and retrieved by microcontroller 412. In one embodiment, sample and hold circuit then samples and holds another set of analog values from band pass filters 462-465.

In one embodiment, microcontroller 412 stores the analog values for a sufficient number of time points and then detects a correlation in the data that characterizes the signals from receiver 415 and microphone 420. In one embodiment, data values for 3 and up to 10 time points are sampled to correlate the signals. In one embodiment, microcontroller 412 calculates the derivative of the RMS power for each bin. These derivative values corresponding to microphone 420 and receiver 415 are then compared to calculate a matching score. In one embodiment, the score for each bin is summed to compute an overall matching score for all bins.

In one embodiment, the rate of analog-to-digital conversion controls the sampling rate of the respective signals. In one embodiment, the sampling rate of A/D converter is configured to resolve the envelope of the filtered signals in order to reduce the amount of data to be processed and, thus, the cost of sensing unit 410. In one embodiment, the audio matching algorithm employed by

5 microcontroller 412 samples the signals for a first number of time points and
rejects frequencies where the correlation does not exceed a predetermined
10 threshold. According to this embodiment, the remaining non-rejected frequencies
are candidates for further inspection. In one embodiment, microcontroller 412
5 samples the signals at the non-rejected frequencies for a second number of time
points exceeding the first number of time points.

15 In one embodiment, sensing unit 410 also compensates for background
noise. In one form, sensing unit 410 via microphone 420 detects the noise of the
surrounding environment and shifts the central frequencies of the band pass filters
20 462-465 away from frequencies where such noise has significant power or
amplitude. In one embodiment, sensing unit 410 shifts the central frequencies of
the band pass filters 462-465 to frequencies where the power or amplitude of the
25 noise is at a minimum. In one such embodiment, the band pass filters include
switch capacitors. Of course, any suitable component for adjusting the central
15 frequencies of the band pass filters can be employed.

30 In another embodiment of the sensing unit of the present invention, the
sensing unit includes a second receiver (not shown). In this embodiment,
microcontroller 412 compares the correlation between the microphone input and
a first receiver tuned to a first frequency and the correlation between the
35 20 microphone input and a second receiver tuned to a second frequency and selects
the frequency exhibiting the higher correlation. In one embodiment, this
comparison is repeated by running a simple tournament among available
40 stations/carrier frequencies to select the candidate or candidates that are accepted
or rejected based on a longer correlation.

25 c. Timing Device

45 Timing device 416 provides a real-time or running time value which
microcontroller 412 stores in association with a detected frequency when a user
activates sensing unit 410. Timing device 416 can be a component physically
50 separate from microcontroller 412 or can, at least in part, be integral to it. In one

embodiment, timing device 416 is a real-time clock providing real-time information, such as date and time of day.

In another embodiment, timing device 416 provides running time information, as described below in section B.4, below. In one form of this embodiment, timing device 416 includes a timing mechanism, such as quartz watch crystal, and a counter operably connected thereto. In one embodiment, when a user activates sensing unit 410 to detect a frequency, microcontroller 412 copies the bits in the counter register to memory and clears the counter register. Microcontroller 412 then stores this time/counter value in association with the detected frequency. Accordingly, the counter register of timing device 416 is reset each time the user activates sensing unit 410. When the user activates sensing unit 410 to transmit the stored physical parameters, microcontroller 412 also copies the timer/counter value to memory and clears the counter register. According to this embodiment, therefore, sensing unit stores and transmits frequencies and timer/counter values corresponding to each frequency, as well as the timer counter value corresponding to the time interval spanning the last detected frequency and synchronization of sensing unit 410 (i.e., transmission of the stored physical parameter data to a second device, such as the user's computer or, directly, to a server according to the present invention).

The intervals of time corresponding to the binary numbers copied from the counter register can be resolved based on the oscillation frequency of the timing mechanism. In one embodiment, timing device 416 includes a standard quartz crystal oscillating at 32,768 Hz and a counter having a 64-bit register. In one form of this embodiment, microcontroller 412 copies and clears only the higher order bits in the counter register, since accuracy down to 1/32,768th of a second, for example, is typically not required. In one embodiment, microcontroller copies and clears only the bits in the counter register necessary to resolve the time intervals to the nearest second.

5

In another embodiment, microcontroller 412 acts as a higher level timer. According to this embodiment, the oscillation crystal, as above, excites a counter. When the register of the counter overflows, the microcontroller wakes up and increases its counter register by 1. In one embodiment, the counter register and oscillation crystal of timing device are configured to overflow every second. Microcontroller 412, therefore, maintains a count of the number of seconds between activation of sensing unit 410 by the user.

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d. Communication of Stored Physical Parameter Data

In the embodiment of Figure 8, communication of stored physical

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parameter data is wireless. In one embodiment, a short depression of button 418 causes sensing unit to detect and store the frequency to which a monitored broadcast receiver is tuned. On the other hand, a long depression of button 418 causes sensing unit 410 to transmit stored physical parameter data. In one form, chirp signal generator 446 emits a signal representative of the stored physical parameter data. In one form of this embodiment, sensing unit 410 also transmits a signal representative of the user's unique identification number. In one embodiment, amplifier 440 amplifies the resulting signal before it is transduced by speaker 426.

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In one embodiment, chirp signal generator 446 is a DTMF generator.

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Accordingly, in one embodiment, a user can position sensing unit 410 next to a phone headset and communicate the stored physical parameter data and/or unique identification number over the phone lines to a server according to the present invention. In another form, sensing unit 410 can also store and transmit a signal representative of the phone number to achieve a dial-up connection to the server. In another embodiment, the user's computer is configured to recognize the DTMF signal and resolve the transmitted physical parameter data. Once in the user's computer, the user can access a server and retrieve data locations corresponding to the observed physical parameter data. In another embodiment,

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5 sensing unit 410 can be physically connected to a user's computer and transmit stored physical parameter data.

10 One embodiment of sensing unit 410 employs the use of a circular buffer memory to facilitate one-way communication. According to one embodiment, 5 sensing unit 410 does not erase physical parameter data from memory after transmission to either client computer 60 or data location site 50 (see Figure 6). 15 Rather, and in one embodiment, the oldest data in the circular buffer memory is overwritten. In one form, when a user activates sensing unit 410 to detect and store physical parameter data, microcontroller 412 writes physical parameter data 20 to the next available location in memory. When microcontroller 412 writes to the last location in memory, it begins at the first memory location and overwrites the physical parameter data previously stored. According to one embodiment, when a 25 user activates sensing unit 410 to transmit the stored physical parameter data, sensing unit 410 transmits the physical parameter data stored in memory. Sensing 15 unit 410, in one embodiment, does not clear the memory after upload, however, because the sensing unit cannot receive confirmation of a successful upload. The 30 user, however, does know if the upload is successful via feed back from data location site 50. In case there is a problem uploading the physical parameter data, the user is prompted to try again. In one embodiment, sensing unit 410 transmits 35 20 all physical parameter data stored in the memory. According to one form of this embodiment, server 52 is configured to recognize and reject previously uploaded physical parameter data. In another embodiment, sensing unit 410 transmits only 40 the physical parameter data that was not previously uploaded.

4. Storage of Time Intervals

25 As discussed above, in one embodiment of the present invention, the 45 sensing units of the present invention sense and store running time values or time intervals rather than real-time values. The use and storage of running time values in sensing units according to one embodiment of the present invention allows use 50 of less expensive timing components, since any drift can be detected and

5 corrected (see below). In addition, the use of running time values further allows
for one-way communication between the sensing unit and the data location site,
10 since the timing device in the sensing unit merely needs to be reset and requires
no synchronization with a remote real-time clock. This embodiment, therefore,
5 further reduces the complexity and cost of the sensing unit.

15 Figures 10, 11 and 12 illustrate methods for use in one embodiment of the
present invention. Figure 10 sets forth a method for detecting and storing physical
parameter data including time values associated with the activation of the sensing
unit and the synchronization of the sensing unit with the server or data location
20 site of the present invention. In one embodiment, when sensing unit 70 is
synchronized, data location site 50 records a first server synchronization time
(Tsync1, which, in one embodiment, is the time and date of the synchronization)
(Figure 10, step 502; Figure 11, step 602). In one embodiment, server 52 records
25 the synchronization time in user account database 56 in association with the
corresponding user or sensing unit identification. In one embodiment, server
synchronization times are based on a standard real-time clock or other timing
device. In one embodiment, the synchronization of the sensing unit occurs when
30 the user activates the sensing unit to transmit physical parameter data to data
location site 50.

35 20 In one embodiment, when a user synchronizes sensing unit 70 with data
location site 50, the timing device in sensing unit 70 is reset or initialized (Figure
10, step 504). After such initialization, the timing device in sensing unit 70 starts
to run. When a user activates sensing unit 70 to detect and store physical
40 parameter data (Figure 10, step 506), sensing unit detects and stores the physical
parameter data including the running time value, t_1 , of the timing device (step
25 508). Accordingly, sensing unit 70 stores the time value interval between
synchronization and first activation of sensing unit 70. In one embodiment, the
time value provided by the timing device corresponds to a second in time. In
45 another embodiment, the time value is merely the number of oscillations of the
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5 timing mechanism, such as a quartz crystal. As discussed above, the actual time value can be resolved by multiplying the oscillation frequency of the timing mechanism with the number of oscillations recorded by the sensing unit.

10 In the embodiment shown, after sensing unit 70 records the physical parameter data, sensing unit 70 resets the timing device (step 504) and waits for another activation by the user. If the user activates sensing unit 70 to detect and record physical parameter data, sensing unit again records a time value, t_2 , provided by the timing device. Accordingly, the time value associated with the second physical parameter data set indicates the time interval between the first and second activations by the user. A user may detect and record physical parameter data up to the limits of the memory in sensing unit 70. In one embodiment, when the memory of sensing unit 70 is full, sensing unit 70 warns the user by emitting a beep or other tone. When the user activates sensing unit 70 to transmit physical parameter data (Figure 10, step 510), sensing unit 70 detects and stores the time value (Trdsync) provided by the timing device (step 512). Sensing unit 70 then transmits the physical parameter data stored in memory and Trdsync to data location site 50 (step 514), either directly or via client computer 60.

35 Figures 11 and 12 illustrate methods for receiving the physical parameter data sets transmitted by sensing unit 70, resolving activation times associated with the physical parameter data sets, and returning data locations relating to such physical parameter data. As discussed above, when the user synchronizes sensing unit 70 to transmit physical parameter data, server 52, in one embodiment, receives and stores the physical parameter data sets and the last-activation-to-synchronization interval, Trdsync (Figure 11, step 604) and stores a second server synchronization time, Tsync2 (step 606). Server 52 then derives activation times (date and time, in one embodiment) for the n number of physical parameter data sets (step 608) to allow for retrieval of data locations corresponding to the physical parameter data and activation times (step 610). In the embodiment shown, server

5 52 transmits the data locations, if any, to the user (step 612) and stores the second
server synchronization time, T_{sync2} , as the first server synchronization time,
10 T_{sync1} , in association with the user's account (steps 614 and 602). Figure 12 sets
forth a method for deriving activation times. However, other methods can also be
5 used. For example, server 52 can calculate the activation times by using $Trdsync$
and the other time intervals and count back from T_{sync2} . According to this
15 embodiment, server 52 need not store a T_{sync1} value, if no error or clock
correction is desired.

Figure 12 sets forth a method for deriving activation times from the physical
20 parameter data transmitted from sensing unit 70. In one embodiment, server 52
corrects the time values transmitted by sensing unit 70. Specifically and in one
embodiment, server 52 first calculates the server synchronization interval ($T_{sync2} -$
25 T_{sync1}), which is the interval of time relative to the real-time clock used by data
location site between synchronizations of sensing unit 70 (Figure 12, step 702). In
15 one embodiment, server 52 also calculates a remote device synchronization
interval by summing the time intervals (t_1 thru t_n) and the last-activation-to-
30 synchronization interval, $Trdsync$, transmitted by sensing unit 70 (step 704). Server
52 then adjusts t_1 thru t_n based on the difference, if any, between the server
synchronization interval and the remote device synchronization interval (step 706).
35 20 In one embodiment, interpolation is used to adjust the running time values, t_1 thru
 t_n .

Whether the running time values, t_1 thru t_n , have been adjusted or not,
40 server 52 then calculates activations times for each physical parameter data set.
Starting at the first physical parameter data set, a base line time, T_b , is set to the
25 first server synchronization time, T_{sync1} , corresponding to the particular sensing
unit 70 (Figure 12, step 708). The activation time (TA_1) for the first physical
45 parameter data set is calculated by adding the running time interval, t_1 , to the base
time value, T_b (step 710). The base time, T_b , is then stepped up by the previous
running time interval, t_1 (step 714). This process is repeated for all physical
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parameter data sets transmitted during synchronization of sensing unit 70 (steps 712, 714, 716 and 720). These activation times can then be used with the physical parameter data transmitted by sensing unit to retrieve data locations, as described above.

5 5. Resolving Geographic Location from Frequency Spectrum Signature of Broadcast Band

15 Embodiments of the frequency sensing unit of the present invention detect geographic location based on the unique signature of the frequency spectrum of the broadcast band. For example, the FM radio broadcast band spans from 88 to 20 108 MHz. Spacing of the carrier frequencies allows for up to 100 different FM broadcast stations in a given geographic or broadcast region. A typical market area, however, has only about ten to fifteen broadcast stations, while a large 25 market may have up to about 30 to 35 broadcast stations. Moreover, the broadcast transmitters of a particular market are spaced throughout the region and 15 broadcast signals of varying strength. Accordingly, these various factors often yield a unique frequency spectrum signature for the broadcast band of each geographic region and locations within each region.

30 In one embodiment, sensing unit 410 scans the broadcast frequency band to detect the frequency spectrum signature. In one embodiment, sensing unit 410 35 20 detects a 1-bit level frequency spectrum signature in that, if a signal of at least a threshold level is detected at a particular frequency, microcontroller 412 stores a value of "1" for that carrier frequency. If no above-threshold signal is detected, 40 microcontroller 412 stores a "0" value. In one form of this embodiment, microcontroller 412 stores the frequency spectrum signature as a string of bits 25 where each bit represents a carrier frequency. In one such embodiment, the first bit in the string corresponds to the lowest carrier frequency in the broadcast band, 45 and the last bit to the highest carrier frequency.

50 In one embodiment, when a user activates sensing unit 410 to store physical parameter data associated with the operation of a broadcast receiver,

5 sensing unit stores the detected frequency, a time value, and the signature of the
broadcast band. According to this embodiment, physical parameter/data location
10 database 54 stores the corresponding broadcast band signatures corresponding to
the broadcast station logs stored in the database. When a user transmits physical
5 parameter data by activating sensing unit 410, server 52 scans database 54
according to broadcast band signature, frequency and activation time to retrieve a
15 corresponding data location.

In another embodiment, sensing unit 410 detects the relative strength of
the signal corresponding to each carrier frequency and stores a multiple-bit value
20 for the power/amplitude of the signal at each carrier frequency. Since the
locations of the various broadcast transmitters in a particular geographic broadcast
region are known, this embodiment therefore allows for detection of the user's
location within each general geographic region based on triangulation concepts
25 known in the art. In one embodiment, physical parameter/data location database
15 54 stores a plurality of broadcast band signatures corresponding to different
locations within each broadcast region. According to this embodiment, the
broadcast band signatures corresponding to different locations have been detected
and recorded in advance and stored in database 54. Therefore, a user's location
30 within a broadcast region can be resolved by comparing known signatures in that
region to the signature detected by the user's sensing unit.
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In another embodiment, geographic location is determined by reference to
an Radio Data System (RDS) signal specific to the broadcast region. In one
40 embodiment, a broadcast station in a particular region is configured to broadcast a
predetermined RDS signal in a side band of the broadcast signal. According to
25 one embodiment, the sensing unit is configured scan the broadcast band and
detect the predetermined RDS signal. In one form, the identity of the carrier
45 frequency at which the RDS signal was detected indicates the particular
geographic region. In another embodiment, the RDS signal includes information
relating to the broadcast region. In this form, the sensing unit is configured to tune
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5 to a predetermined carrier frequency and resolve the RDS signal to determine the user's geographic location.

10 C. Other Physical Parameter Sensing Units

Other embodiments of the sensing unit depend on the listener to specify
5 the frequency of the broadcast. Figure 4 illustrates one such embodiment in the form of a common hand-held computer 210 having a touch-activated screen 212. According to the invention, hand-held computer is programmed to display buttons
15 214 on screen 212. Buttons 214 correspond to the particular listener's preferred radio stations. When the listener desires more information about a particular
20 broadcast, she simply touches the pre-programmed buttons 214 corresponding to the radio station to which the radio receiver is tuned. Hand-held computer 210 is programmed to store the radio station selected and the time it was selected. The listener synchronizes hand-held computer 210 with a standard notebook or
25 desktop computer by any suitable means or uses hand-held computer 210 to
15 communicate directly with the server of the present invention.

Yet another embodiment of the sensing unit of the present invention
30 includes a software application activated by a button on the task bar of a typical graphical user interface on the listener's computer. This embodiment has especial application in the context of Internet audio and video streams, where the listener
35 is typically at or near her computer. In a preferred embodiment, when the listener clicks on the button on the task bar, the task bar application presents the listener with a list of stations in a pop-up menu. The application stores the selected
40 broadcast station and the time for subsequent transmission to the database.

Lastly, the listener may use the telephone to communicate observed
25 physical parameters directly to the server of the present invention. In this embodiment, the listener notes the frequency of the broadcast and telephones the server. In one embodiment, a hand-held device including a bar code reader is configured to scan a sheet of paper having bar codes corresponding to different
45 radio and/or television broadcast stations. To The server prompts the listener for
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5 the frequency and the time of the observation. The server may use the time of the phone call as a default time value, unless otherwise specified by the listener.

10 Additionally, the server may prompt the listener for the location of the observation or trace the location of the call through conventional means, if possible.

5 As discussed above, the database for use with physical parameters identifying radio broadcasts associates the physical parameters of frequency and time with data locations or URLs. In addition, a database that includes
15 information relating to more than one geographic area may also include the broadcast area as an additional physical parameter. The broadcast area parameter
20 could be provided by the listener after transmission of the observed physical parameters. Similarly, the broadcast area could be a default value based upon the listener's profile or membership information. In addition, the sensing unit may
25 include a global positioning (GPS) unit providing the listener's geographic location when the user activates the sensing unit.

15 To construct the database for a particular geographic area, the play lists of participating or desired radio stations must be obtained. A typical play list includes the song title, artist, and a starting time. A play list may also include information relating to the broadcast or advertising. The play list data is used to associate data locations with the physical parameters of time and frequency. For example, a
35 hypothetical musical group named "RockBand" may have a web site denoted by the URL, <http://www.rockband.com/>. A playlist from a particular radio station, broadcasting over the 102.1 megahertz carrier frequency, reveals that RockBand's
40 latest song will play on May 30, 1999 at 13:05:32 (hh:mm:ss). According to the invention, the data location "<http://www.rockband.com/>" will be associated with
25 the frequency of 102.1 megahertz and the time of May 30, 1999 at 13:05:32. In one preferred embodiment, a record will be created that includes the frequency of the broadcast, the start time of the song, the name of the song and artist, and the associated data location or URL. As discussed above, this record may also include
50 the geographic area of the broadcast station.

5 According to the invention, a server receives queries from a client
computer over a computer network or a direct dial-up connection and scans the
10 database of the present invention for data locations corresponding to received
physical parameters. The server of the present invention may be implemented in
5 hardware or software, or preferably a combination of both. In preferred form, the
server is implemented in computer programs executing on programmable
15 computers each comprising at least one processor, a data storage system (including
volatile and non-volatile media), at least one input device, and at least one output
device. In addition, the server of the present invention may also store the results
20 of each query to develop user profiles and other statistical data for subsequent use.

Additionally, other physical parameters may be employed in the radio
broadcasting context according to the present invention. In one preferred
25 embodiment, the physical parameter includes an audio signature or "watermark"
embedded in the digital recording data. The sensing unit of this embodiment is
15 programmed to sense the watermark particular to a song or advertisement. The
sensing unit stores the watermark upon activation of the unit by the listener. The
30 watermark comprises a unique identification number. According to this
embodiment, the server includes records having the unique identification number
and at least one corresponding data location or URL. Accordingly, a query that
35 contains an identification number will return an associated data location.

D. Application of Present Invention to Other Contexts

Television Broadcasting

40 Another application of the present invention lies in television broadcasting.
According to the invention, the server is configured similarly to that discussed
25 above in the radio broadcasting context. Each data location has corresponding
physical parameters of time and channel frequency. Additional physical
45 parameters may also include broadcast location. The sensing units and methods
discussed above may be used in the television broadcasting context. Of course,

5 application to television broadcasts requires changing the range of frequencies in which such sensing units operate.

10 In another embodiment, the sensing unit for use with television broadcasting may be incorporated into the remote control unit of the user's television. In one embodiment, the sensing unit stores the currently viewed
5 television channel in a buffer and includes a real-time clock. When the user presses a button on the remote control that activates the sensing unit, the television channel and the signal from the clock are stored in memory. In one
15 embodiment, these stored physical parameters may be transmitted from the remote unit to a computer equipped with an infrared device.

20 Concert Poster and Other Bar Codes

Another embodiment of the present invention includes the use of bar codes
25 or other graphical patterns to convey information. Accordingly, the observed bar codes or other graphical patterns are the physical parameters observed by a sensing unit and communicated to the server of the present invention. The
15 sensing unit of one preferred embodiment includes a standard bar code reader and a means for storing the data captured by the bar code reader.

30 By way of example, a concert promoter typically advertises a particular concert by, among other things, displaying posters in a particular area. According
35 to the invention, a bar code or other graphical representation is provided on the poster. If the reader of the poster desires to find a web site with ticket ordering or other information about the concert, he swipes the bar code reader of the sensing
40 unit over the bar code provided on the poster. In one preferred embodiment, the bar code, when read, provides a unique identification number, which the sensing unit stores in memory. When the user has access to a computer, the identification
25 number is transmitted to the server of the present invention, which returns the associated data location or URL.

45 As one can imagine, bar codes may appear in myriad locations. A vendor could include a bar code in several locations at a trade show booth. An advertiser
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5 can include a bar code in a print advertisement in newspaper, magazines, or other
print media. Furthermore, many products already include bar codes expressing
10 UPC information. This UPC information could similarly be associated with a data
location pointing to the product manufacturer's web site. In another embodiment,
5 a retail store can include bar codes on price tags or stickers. A customer can walk
through the retail store show room and scan the bar codes on the price tags using
15 the sensing unit discussed above. Later, when the customer has returned to her
home, she may transmit these stored physical parameters to her home computer
and access the server of the present invention. The server returns the data
20 location corresponding to the retail store's web site and a list of the items scanned
by the customer. The customer uses this list to order these products on the retail
store's web site.

25 In yet another embodiment, the retail store price tag may include UPC
information and a vendor identification number. The server of this embodiment
15 returns the data location of the product manufacturer's or distributor's web site to
the customer based on the product number. When the customer orders the
30 product through this web site, the vendor identification number is also transmitted.
This allows, for example, the retail store to receive a commission on the sale.

Real World Images

35 20 In another embodiment, the physical parameters are actual images
captured in the physical world. One such image for example, could be a car
manufacturer's logo or emblem. The sensing unit of this embodiment includes a
40 digital camera that captures and stores images in digital form. A user seeing a car
that is of interest simply points the digital camera at the emblem appearing on the
25 hood and captures the image. The server according to the invention compares the
image captured by the digital camera with digital images stored in its database. If
45 a matching image is located, the server returns the associated data location, which
in this instance could be the car manufacturer's web site, a local dealer's web site,
or both.
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Business Card Link

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Other embodiments of the present invention contemplate the exchange of physical parameters between sensing units. The sensing units of one preferred embodiment store an identification number that is unique to a particular individual or business entity and have the capability of transmitting this identification number by means of an infrared or sound transmitter. The sensing units of this embodiment also include the ability to read and store the identification number transmitted by other sensing units. For example and in a preferred embodiment, each sensing unit includes an activator button. To exchange identification numbers, the sensing units are pointed at one another and the buttons depressed causing an exchange of identification numbers. Thus, in this instance, the observed physical parameters are infrared or sonic signals expressing an identification number. In one embodiment, the physical parameter data could be transmitted using the DTMF generator of the sensing unit shown in Figure 8 or at radio frequencies using the transmitter.

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The server of the present invention stores an association between these identification numbers and corresponding data locations or URLs. In this manner, two people can exchange links to each other's contact information. This information exchange is dynamic in the sense that, rather than exchanging the information itself, which may change over time, links to information or data locations are exchanged. Therefore, while the link or data location remains the same, the information corresponding to the data location may be constantly refreshed.

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Yet another embodiment features a retail store equipped with a radio beacon that transmits infrared or sonic signals expressing an identification number. When a customer is in the retail store, the user may activate the sensing unit to sense the signal and store the retail store's identification number. As above, the customer later transmits the identification number to the server of the present invention to retrieve a data location corresponding to that retail store.

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Sightseer/Tourist Example-GPS System

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Geographic location may be the primary physical parameter in a server designed to assist sightseers and tourists. The sensing unit in this circumstance may comprise a hand-held or other portable computer equipped with a GPS unit. The user activates the sensing unit such that it records the geographic location provided by the GPS unit. Of course, any suitable device for sensing geographic location may be used, including but not limited to radio-based systems, such as LORAN®, or other satellite receiver navigation systems. The user can also enter into the hand-held computer such search terms as "restaurant," "dining," or "museums" and even a geographic radius within which information is desired. The hand-held computer can then transmit the observed geographic location together with other user-specified information to the server of the present invention by any conventional means. The server then retrieves data locations or URLs corresponding to the observed geographic location and the search terms entered by the user. In a preferred embodiment, the hand-held computer may include an Internet browser such that the user can access the desired information immediately subsequent to receiving the data locations from the server.

Movie Theater

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In another preferred embodiment of the present invention, the observed physical parameter is an audio signature embedded in the audio track of a movie preview. The sensing unit of the present invention is configured to recognize the audio signature and store it in memory upon activation by the user. Therefore, when the user desires more information about the movie being previewed, he simply activates the device during the movie preview to store the audio signature. The server of the present invention in response to a data location request containing such audio signature returns the data location corresponding to that particular movie. The web site itself offers, for example, advance ticket sales, a sound track of the movie on CD play times, promotional items, theater locations, and reviews.

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SUMMARY

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With respect to the above-provided description, one skilled in the art will readily recognize that the present invention has application in a variety of contexts. The foregoing description illustrates the principles of the present invention and provides examples of its implementation. Accordingly, the description is not intended to limit the scope of the claims to the exact embodiments shown and described.

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Claims

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CLAIMS

What is claimed is:

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1. A method for identifying an explicit data location on a computer network corresponding to a physical observation, wherein said physical observation

5 includes at least one physical parameter, wherein said physical parameter(s) does not directly identify an explicit data location, said method comprising the steps of

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(a) associating a data location with a physical observation to allow selection of said data location based on said physical observation; and

(b) selecting said data location based on said physical observation.

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2. The method of claim 1 wherein the associating step (a) further includes the steps of

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(a1) accessing a database including a designation of a physical observation and an indication of the data location; and

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(a2) using the designation of the physical observation and the indication of the data location to associate the data location with the physical observation to allow selection of the data location based on the physical observation.

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3. The method of claim 1 wherein the data location includes an Internet domain address.

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4. An apparatus for identifying an explicit data location on a computer network corresponding to physical parameters, wherein said physical parameters do not directly identify an explicit data location, said apparatus comprising

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(a) data storage means for storing data locations and physical parameters corresponding to said data locations; and,

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(b) means for selecting a data location based on said corresponding physical parameters.

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5 5. The apparatus of claim 4 further comprising means for receiving physical parameters.

10 6. The apparatus of claim 4 further comprising means for transmitting data
5 locations to a client computer.

15 7. The apparatus of claim 5 further comprising means for transmitting data locations to a client computer.

20 10 8. An apparatus for identifying an explicit data location on a computer network corresponding to physical parameters, wherein said physical parameters do not directly identify an explicit data location, said apparatus comprising
25 a database having a list of data locations, said database storing associated physical parameters for corresponding ones of said data locations;
15 a processor coupled to said database, said processor also being coupled to receive a data location request containing physical parameters, said processor
30 accessing said database according to said physical parameters in said data location request to retrieve the data location corresponding to said physical parameters.

35 20 9. The apparatus of claim 8 wherein said processor is coupled to transmit a data location in response to said data location request.

40 10. A method of identifying an explicit data location based upon observed physical parameters corresponding to a broadcast, wherein said physical
25 parameters do not directly identify an explicit data location, said method comprising the steps of
45 (a) associating a data location with a first physical parameter and a second physical parameter to allow selection of said data location based upon said first
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5 and second physical parameters; said first physical parameter being broadcast frequency and said second physical parameter being time, and

10 (b) selecting said data location based upon said first and second physical parameters.

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15 11. The method of claim 10 wherein the associating step (a) further includes the steps of

(a1) accessing a database including a designation of first and second physical parameters and an indication of said data location;

20 10 (a2) using the designation of said first and second physical parameters and said indication of the data location to associate the data location with said first and second physical parameters to allow selection of said data location based upon said first and second physical parameters.

15 12. A method for identifying an explicit data location on a computer network corresponding to physical parameters, wherein said physical parameters do not directly identify an explicit data location, said method comprising the steps of:

30 (a) observing a physical event or object by sensing at least one physical parameter;

35 20 (b) transmitting said physical parameter(s) to a database, said database having a list of data locations, said database storing associated physical parameters for corresponding ones of said data locations.

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25 13. The method of claim 12 wherein said observing step (a) further includes storing said at least one physical parameter.

45 14. The method according to claim 12 wherein said observing step (a) comprises the steps of

50 (a1) observing the broadcast frequency to which a radio receiver is tuned;

5 (a2) observing the time at which said broadcast frequency was observed.

10 15. The method according to claim 14 wherein said transmitting step (b) comprises

5 (b1) transmitting said observed broadcast frequency and said observed time according to steps (a1) and (a2), wherein said associated physical parameters of
15 said database include broadcast frequency and time for corresponding ones of said data locations.

20 16. An apparatus for sensing physical parameter data associated with the operation of a receiver, wherein said physical parameter data comprises the frequency to which the receiver is tuned, said apparatus comprising a frequency
25 detector and an activation button operably connected to said frequency detector, wherein depression of said activation button activates said frequency detector.

15 17. An apparatus for sensing physical parameter data associated with the operation of a receiver, wherein said physical parameter data comprises the frequency to which the receiver is tuned, said apparatus comprising:
30 a transmitter for transmitting a signal over a carrier frequency to the
35 receiver;
20 means for detecting whether the receiver output corresponds to said signal.

40 18. The apparatus of claim 17 further comprising an input device coupled to said transmitter for selectively activating said transmitter.

25 19. The apparatus of claim 17 further comprising means for changing the carrier frequency of said signal transmitted by said transmitter.

50 20. The apparatus of claim 18 further comprising

5 a clock for generating a time signal;

storage means coupled to said input device, said transmitter, said means for
10 detecting and said clock; wherein said storage means stores (a) the time signal
corresponding to the time said input device activates said transmitter and (b) the
5 state of the transmitter when said means for detecting determines that the receiver
output corresponds to said signal.

15 21. The apparatus of claim 20 further comprising means for changing the carrier
frequency of said signal transmitted by said transmitter.

20 22. The apparatus of claim 20 further comprising transmission means coupled to
said storage means for transmitting the contents of said storage means to a server.

25 23. The apparatus of claim 21 further comprising transmission means coupled to
15 said storage means for transmitting the contents of said storage means to a server.

30 24. An apparatus for sensing physical parameter data associated with the
operation of a receiver, wherein said physical parameter data comprises the
frequency to which the receiver is tuned, wherein the receiver receives a first
35 20 signal in a modulated domain and produces a corresponding first demodulated
signal in a demodulated domain, the apparatus comprising

means for receiving the first demodulated signal from the receiver;

40 means for receiving said first modulated signal in the modulated domain
and producing a second demodulated signal in the demodulated domain; and

25 means, coupled to each of the receiving means, for detecting a correlation
45 between the first demodulated signal and the second demodulated signal.

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25. The apparatus of claim 24 wherein said means for receiving a modulated
signal and producing a second demodulated signal, demodulates said first signal
10 with respect to a range of frequencies.

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26. The apparatus of claim 24 further comprising
15 a clock for generating a time signal;
storage means coupled to said input device, said means for detecting and
said clock; wherein said storage means stores (a) the time signal corresponding to
20 the time said input device activates said means for detecting and (b) the state of
the means for detecting when said means for detecting determines that the first
demodulated signal corresponds to said signal.

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27. A system for identifying an explicit data location on a computer network
15 corresponding to physical parameters, wherein said physical parameters do not
directly identify an explicit data location, said system comprising
30 a physical parameter data sensing unit comprising
means for sensing a physical parameter, and
means for communicating a data location request including said
35 physical parameter;
20 and
a data location identifier operatively coupled to said data sensing unit
40 comprising
a database having a list of data locations, said database storing
25 associated physical parameters for corresponding ones of said data
locations;
45 a processor coupled to said database, said processor also being
coupled to receive a data location request containing physical parameters,
said processor accessing said database according to said physical
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5 parameters in said data location request to retrieve the data location
corresponding to said physical parameters.

10 28. The system of claim 27 wherein said physical parameter data sensing unit
5 further comprises means for storing said physical data parameter.

15 29. A system for identifying an explicit data location on a computer network
corresponding to physical parameters, wherein said physical parameters do not
directly identify an explicit data location, said system for use on an interactive
20 10 network, comprising
a physical parameter data sensing unit comprising
means for sensing a physical parameter, and
means for communicating physical parameters to a remotely located
25 terminal,
15 a remotely located terminal operatively connected to said data sensing unit,
said remotely located terminal including means for communicating a data
30 location request including said physical parameter;
and a centrally located data location request processing unit,
a database provided at said data location request processing unit, said
35 20 database having a list of data locations, said database storing associated
physical parameters for corresponding ones of said data locations;
a processor coupled to said database, said processor also being coupled to
40 receive a data location request containing physical parameters, said
processor accessing said database according to said physical parameters in
25 said data location request to retrieve the data location corresponding to
said physical parameters,
45 and
a communication network which interfaces said remotely located terminal
with said centrally located data location request processing unit, said
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communication network transferring said data location request from said
remote terminal to said centrally located processing unit.

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30. A method for sensing physical parameter data and retrieving data locations
5 relating to the physical parameter data, the method comprising the steps of:
 (a) initializing a clock in a first device and storing a first synchronization
15 time in a second device;
 (b) upon activation by a user, storing in the first device physical parameter
data including the interval of time between the first synchronization time and the
20 activation by the user;
 (c) transmitting the interval of time and the physical parameter data stored
in step (b) to the second device;
25 (d) receiving from the second device supplemental information related to
the physical parameter data.

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31. The method of claim 30 wherein said second device comprises a server
30 remote from said first device and operably coupled to a computer network.

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32. The method of claim 31 wherein said transmitting step (c) further comprises
20 (c1) operably connecting the first device to the computer network to
transmit data from the first device to the server.

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33. The method of claim 30, 31, or 32 wherein said physical parameter data
comprises the frequency to which a broadcast receiver is tuned.

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34. A method for sensing physical parameter and retrieving data locations relating
45 to the physical parameter data, the method comprising the steps of:
 (a) initializing a clock in a first device and storing a first synchronization
50 time in a second device;

5 (b) upon activation by a user, storing in the first device physical parameter data including the interval of time between the first synchronization time and the activation by the user;

10 (c) upon each subsequent activation by a user, storing in the first device
5 corresponding physical parameter data including the interval of time between activations;

15 (d) transmitting, upon activation of the user, the intervals of time and the corresponding physical parameter data stored in steps (b) and (c) to the second device;

20 (e) receiving from the second device supplemental information related to the intervals of time and other physical parameter data transmitted in step (d).

25 35. The method of claim 34 further comprising the step of (d1) storing the interval of time between the last activation of the user in step (c) and the activation in step
15 (d); and (d2) transmitting the interval of time stored in step (d1) to the second device.

30 36. The method of claim 34 or 35 wherein said physical parameter data comprises the frequency to which a broadcast receiver is tuned.

35 20 37. The method of claim 34 wherein said supplemental information received in step (e) comprises a data location relating to said physical parameter data.

40 38. A method for sensing physical parameter and retrieving data locations relating
25 to the physical parameter data, the method comprising the steps of:

45 (a) upon activation by a user, storing in a first device physical parameter data including the interval of time between a first synchronization of the first device with a second device and the activation by the user;

5 (b) upon each subsequent activation by a user, storing in the first device
corresponding physical parameter data including the interval of time between
10 activations;

(c) transmitting, upon activation of the user, the intervals of time and the
5 corresponding physical parameter data stored in steps (a) and (b) to the second
device;

15 (d) receiving from the second device supplemental information related to
the intervals of time and other physical parameter data transmitted in step (c).

20 39. The method of claim 38 further comprising the step of (d1) storing the interval
of time between the last activation of the user in step (b) and the activation in step
(c); and (d2) transmitting the interval of time stored in step (d1) to the second
25 device.

15 40. A method for providing supplemental information based on remote sensing of
physical parameter data, said method comprising the steps of:

30 (a) recording a first synchronization time;

(b) receiving physical parameter data including a first physical parameter
and a time interval;

35 20 (c) deriving an activation time based on the first synchronization time and
the time interval;

40 (d) scanning a database to retrieve supplemental information based on the
activation time and the first physical parameter.

25 41. The method of claim 40 wherein said deriving step (c) comprise the step of
(c1) adding the time interval to the first synchronization time.

42. A method for providing supplemental information based on remote sensing of
physical parameter data, said method comprising the steps of:

- 5 (a) recording a first server synchronization time;
- 10 (b) receiving at least one physical parameter data set and a remote device synchronization time interval, said physical parameter data set including a first physical parameter and a corresponding time interval;
- 5 (c) recording a second server synchronization time;
- 15 (d) deriving activation times corresponding to each physical parameter data set received in step (b) based on the time intervals in the physical parameter data sets, the first and second synchronization times, and the synchronization time interval received in step (b); and,
- 20 10 (e) scanning a database to retrieve supplemental information related to the activation times derived in step (d) and the first physical parameters received in step (b).

- 25 43. The method of claim 42 wherein said deriving step (d) comprises the steps of:
- 15 (d1) calculating a server synchronization interval based on the first and second server synchronization times;
- 30 (d2) calculating a remote device synchronization interval based on the time intervals in the physical parameter data sets and the remote device synchronization time interval;
- 35 20 (d3) correcting the time intervals corresponding to each physical parameter data set based on the difference between the server synchronization interval and the remote device synchronization interval;
- 40 (d4) calculating the activation times corresponding to each physical parameter data set by adding the corresponding corrected time interval to the first
- 25 server synchronization time.

- 45 44. The method of claims 42 or 43 wherein the physical parameter data comprises the frequency to which a broadcast receiver is tuned, and wherein the

5 time interval corresponds to the interval of time between activations of a first device for storing the frequency.

10 45. A method for transmitting physical parameter data to retrieve data locations related to the physical parameter data, the method comprising the steps of:

- 15 (a) detecting physical parameters;
(b) storing encrypted representations of the physical parameters, wherein the encrypted representations of the physical parameters are encrypted with an encryption key; and
20 10 (c) transmitting the encrypted representations of the physical parameters to a server to retrieve a data location related to the physical parameters.

25 46. The method of claim 45 further comprising the step of

- (d) receiving a data location related to the physical parameters.

15 47. The method of claim 45 or 46 wherein said transmitting step further comprises

- (c1) transmitting a user identification to the server.

35 20 48. A method for retrieving a data location based on the observation of real world events, said method comprising the steps of:

- 40 (a) providing a sensing unit to a user, said sensing unit encrypting representations of physical parameter data with an encryption key;
(b) receiving encrypted representations of physical parameter data from
25 said sensing unit;
(c) decrypting the encrypted representations of said physical parameter data; and,
45 (d) retrieving a data location related to said physical parameter data.

5 49. The method of claim 48 wherein said sensing unit has a unique encryption
key and said user has a unique user identification; and wherein said method
10 further comprises the step of

(a1) storing said unique encryption key in association with said user
5 identification.

15 50. The method of claim 49 further comprising the steps of:

(b1) receiving a user identification from a user; and,

(b2) retrieving the encryption key associating with said user identification;

20 wherein said encryption key retrieved in step (b2) is used in said decrypting step
(c).

25 51. The method of claim 49 wherein said sensing unit has a unique encryption
key and a unique sensing unit identification; and wherein said method further

15 comprises the step of (a1) storing said unique encryption key in association with
said sensing unit identification.

30 52. The method of claim 51 further comprising the steps of:

(b1) receiving a sensing unit identification from a user; and,

35 20 (b2) retrieving the encryption key associating with said sensing unit
identification;

wherein said encryption key retrieved in step (b2) is used in said decrypting step
40 (c).

25 53. An apparatus for identifying an explicit data location on a computer network
corresponding to physical parameters, wherein said physical parameters do not
45 directly identify an explicit data location, said apparatus comprising
a database having a list of data locations, said database storing associated
first and second physical parameters for corresponding ones of said data locations;
50

5 a processor coupled to said database, said processor also being coupled to
receive a data location request containing said first and second physical
10 parameters, said processor accessing said database according to said first and
second physical parameters in said data location request to retrieve the data
5 location corresponding to said first and second physical parameters;
a user account database storing user accounts including user identifications
15 and data locations;
wherein said processor stores said data locations in said user
account database; and,
20 10 a monitoring agent responsive to said data locations stored in said user
account database and operable to retrieve additional data locations based on said
data locations stored in said user account.

25 54. An apparatus for detecting the frequency to which a broadcast receiver is
15 tuned, comprising:
a controller,
30 an active frequency detection module operably connected to said
controller,
a passive frequency detection module operably connected to said
35 20 controller,
and an activation button operably connected to said controller, wherein
depression of said activation button activates said controller;
40 wherein, upon such activation of said controller, said controller operates a
predetermined one of said active frequency detection module or said passive
25 frequency detection module to detect the frequency to which said broadcast
receiver is tuned; and, wherein, if no frequency is detected, said controller
45 operates the other of said frequency detection modules to detect the frequency to
which said broadcast receiver is tuned.

5 55. The apparatus according to claim 54 further comprising a timing device
operably connected to said controller and a memory operably connected to said
10 controller, wherein upon activation of said controller, said controller stores in said
memory a time value from said timing device and the frequency to which said
5 broadcast receiver is tuned.

15 56. The apparatus of claim 54 or 55 wherein said controller stores at least one
preset carrier frequency, and wherein said controller operates a predetermined
one of said active frequency detection module or said passive frequency detection
20 10 module to detect whether said preset carrier frequency is the frequency to which
said broadcast receiver is tuned; and wherein if no match is detected, said
controller operates the other of said frequency detection modules to detect
whether said preset carrier frequency is the frequency to which said broadcast
25 receiver is tuned.

15 57. The apparatus of claim 56 wherein, if no matching preset carrier frequency is
30 detected, said controller scans the entire broadcast band to detect the frequency
to which said broadcast receiver is tuned.

35 20 58. The apparatus of claim 54 further comprising a timing device operably
connected to said controller; wherein, upon activation by a user, said controller
stores the time value of said timing device.

40 59. The apparatus of claim 58 wherein, upon said activation, said controller resets
25 said timing device.

45 60. A method for resolving geographic location based on the frequency spectrum
signature of a broadcast band in said geographic location, said method comprising
the steps of:
50

- 5
- (a) scanning a broadcast band in a geographic location;
- (b) for at least one carrier frequency in said broadcast band, recording a
- 10 signal value to derive a broadcast band signature; and,
- (c) transmitting said broadcast band signature to a server, said server storing
- 5 broadcast band signatures corresponding to a plurality of geographic locations.

- 15
61. The method of claim 60 further comprising the step of
- (a1) detecting the frequency to which a broadcast receiver is tuned;
- (a2) recording a time value related to said detecting step (a1); and,
- 20 wherein said transmitting step further comprises
- (c1) transmitting the frequency to which a broadcast receiver is tuned and
- time value to said server.

- 25
62. The method of claim 61 wherein said time value is a real-time value.

- 15
63. The method of claim 61 wherein said time value is a time interval.

- 30
64. A method for resolving geographic location based on the frequency spectrum
- signature of a broadcast band in said geographic location, said method comprising
- 35 the steps of:

- (a) scanning a broadcast band in a geographic location;
- (b) for at least one carrier frequency in said broadcast band, recording a
- 40 signal value to derive a broadcast band signature; and,
- (c) storing in a database said broadcast band signature in association with
- 25 said geographic location.

- 45
65. The method of claim 64 further comprising the step of:
- (d) repeating steps (a) - (c) for a plurality of geographic locations.

5

66. The method of claim 65 further comprising the steps of:

(e) receiving a broadcast band signature;

10

(f) scanning said database to retrieve the geographic location corresponding to the broadcast band signature matching the broadcast band signature received in step (e).

15

67. The method of claim 64, 65 or 66 wherein said broadcast band signature is a 1-bit level signature.

20

10 68. The method of claim 67 wherein said broadcast signature is a multiple-bit level signature.

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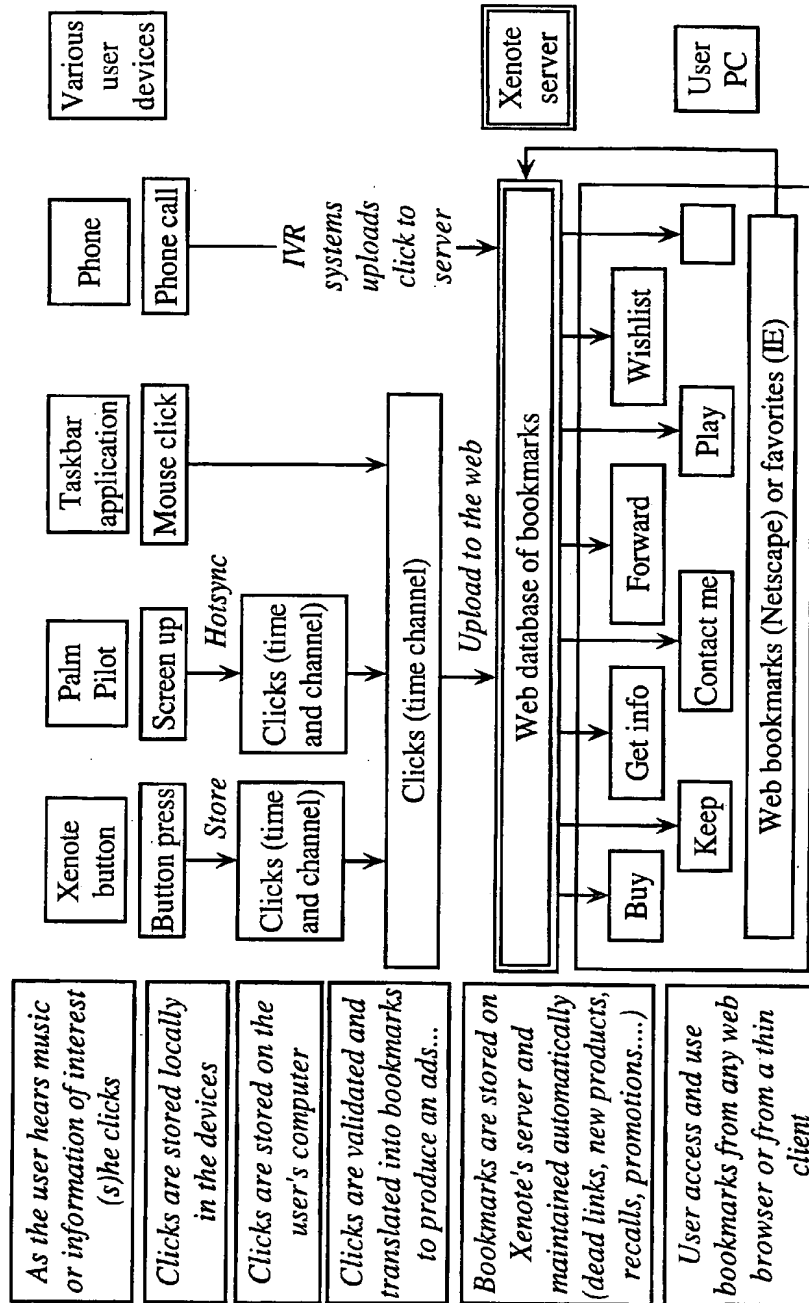


FIG. 1

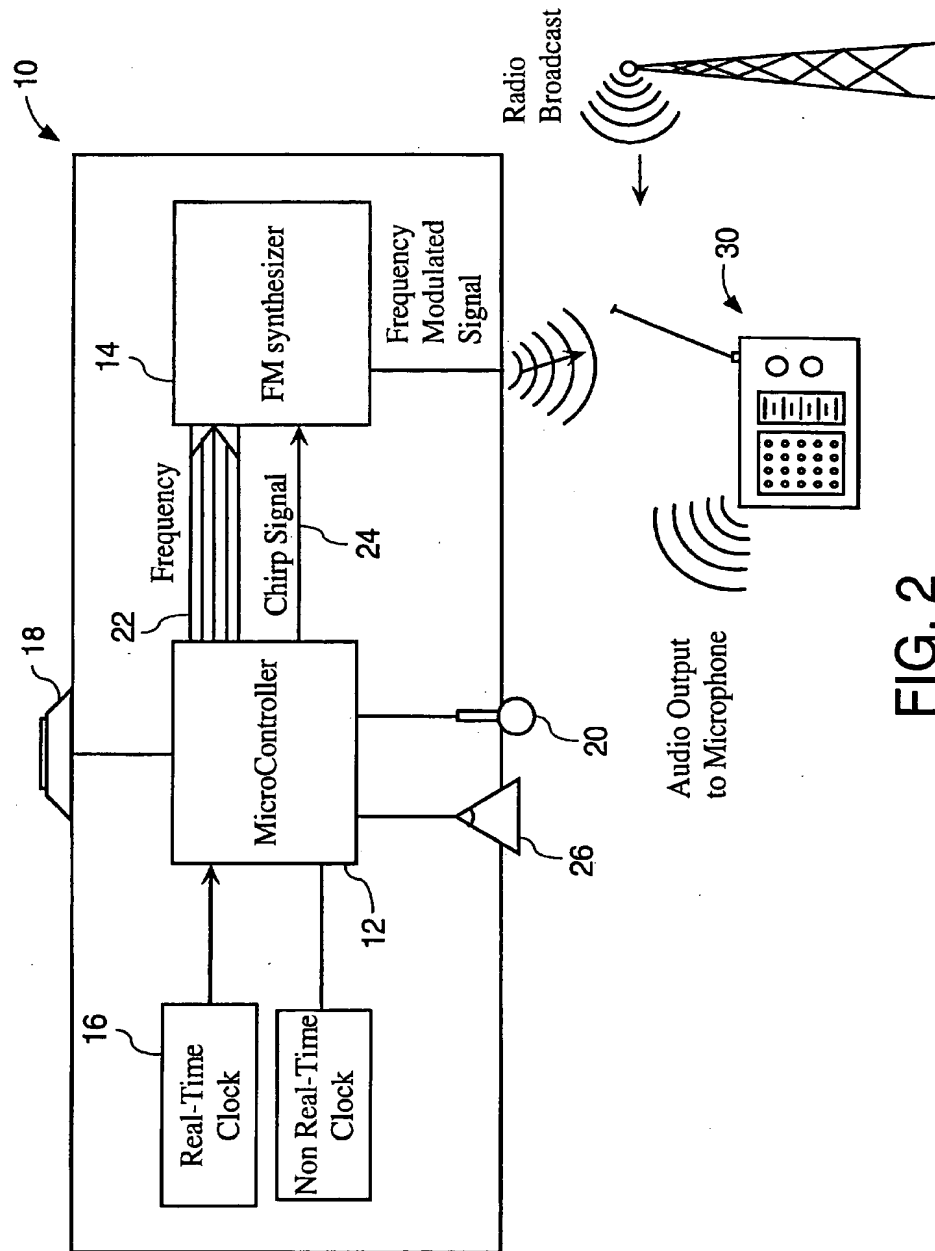


FIG. 2

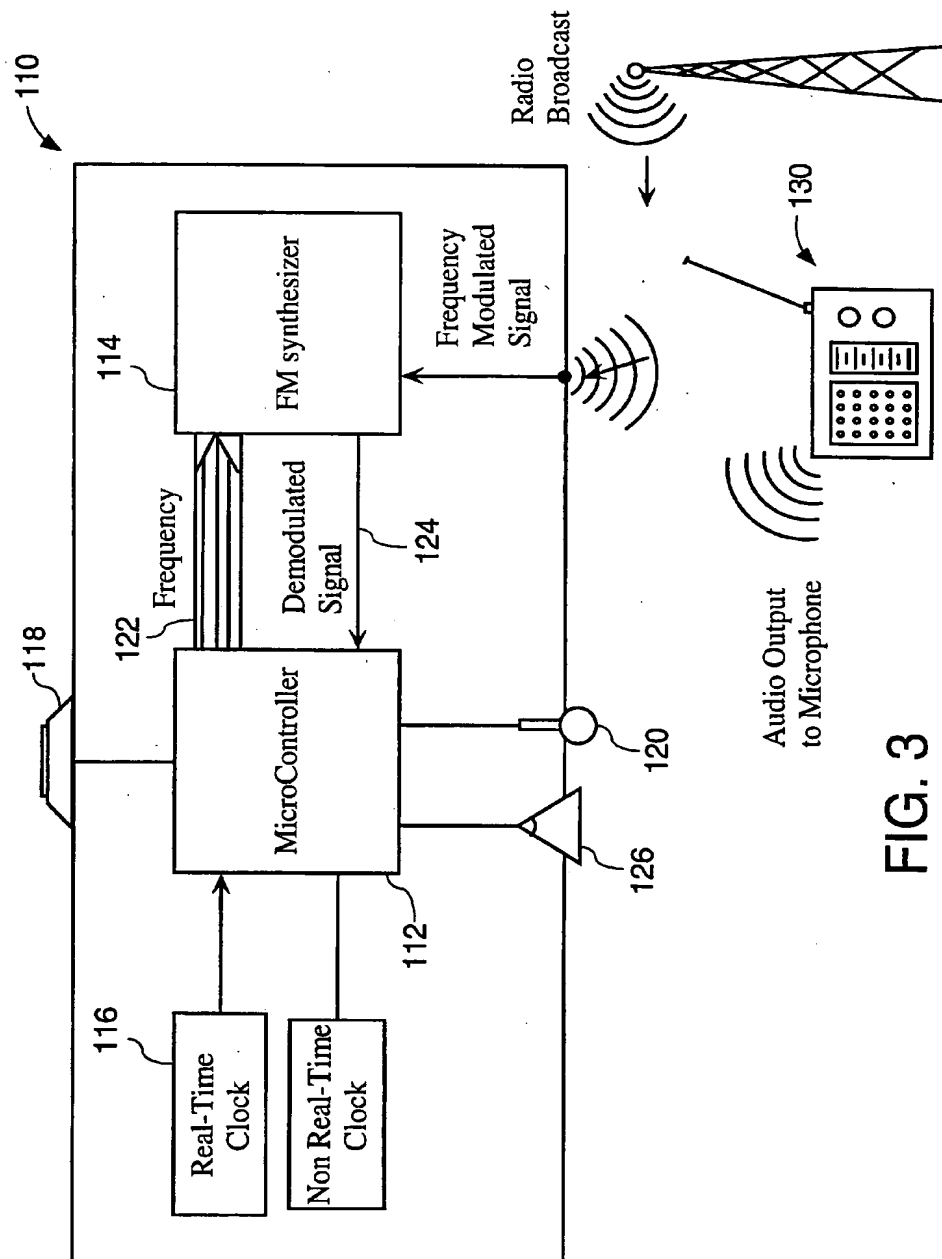


FIG. 3

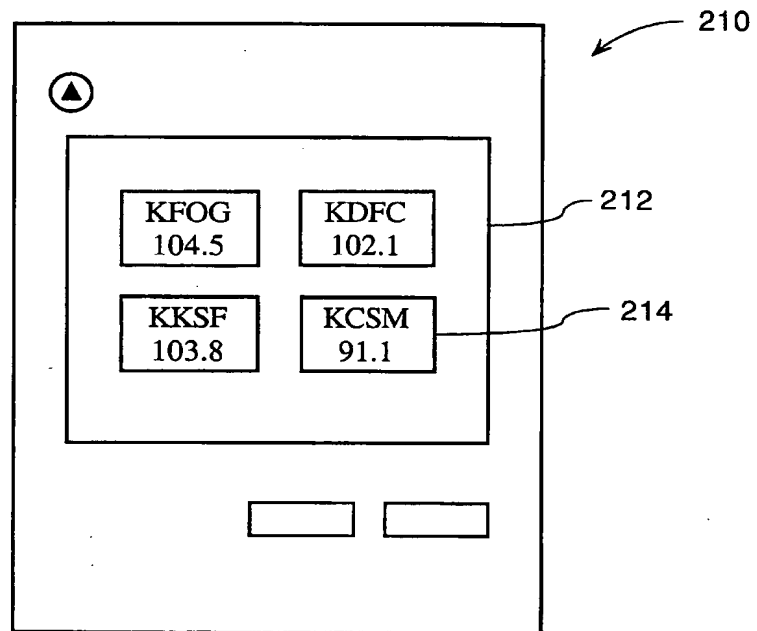
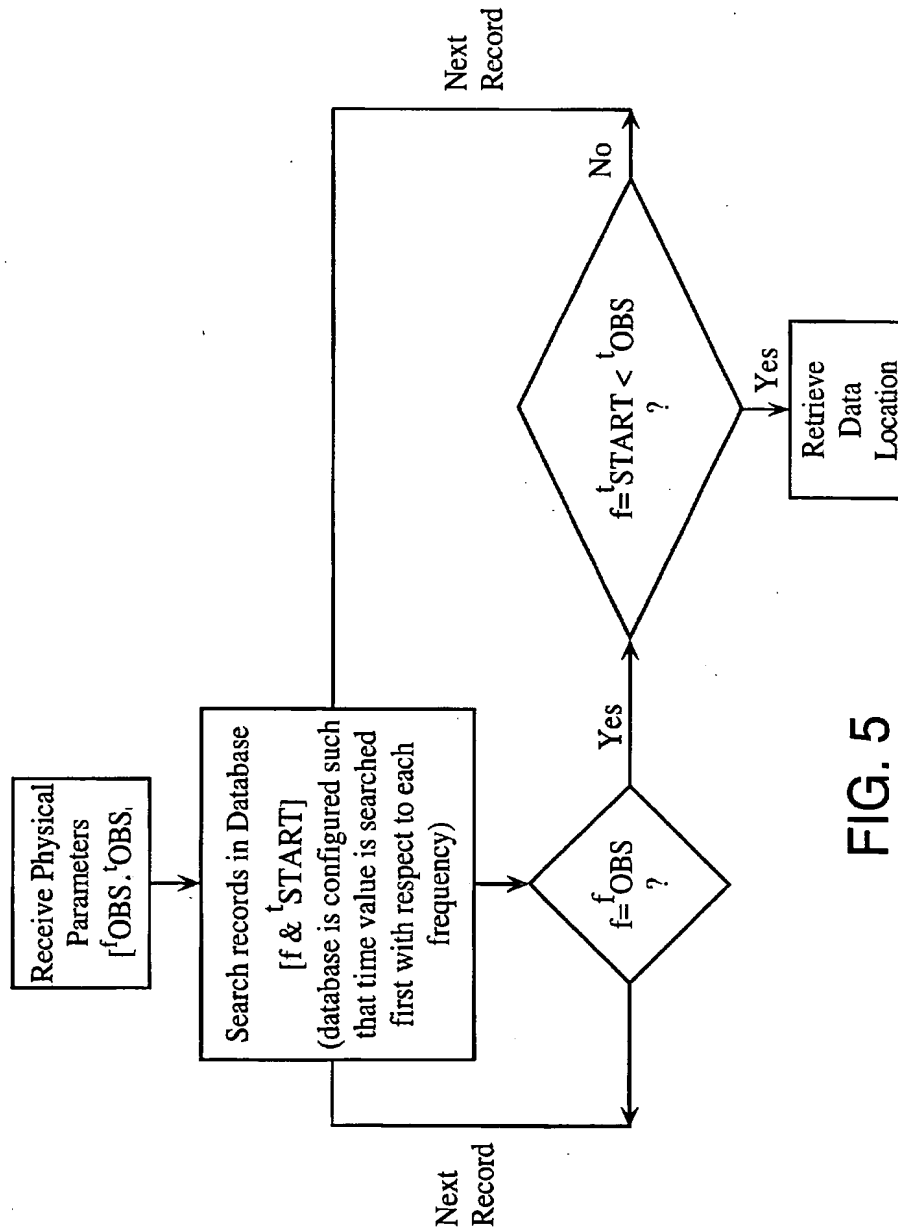


FIG. 4

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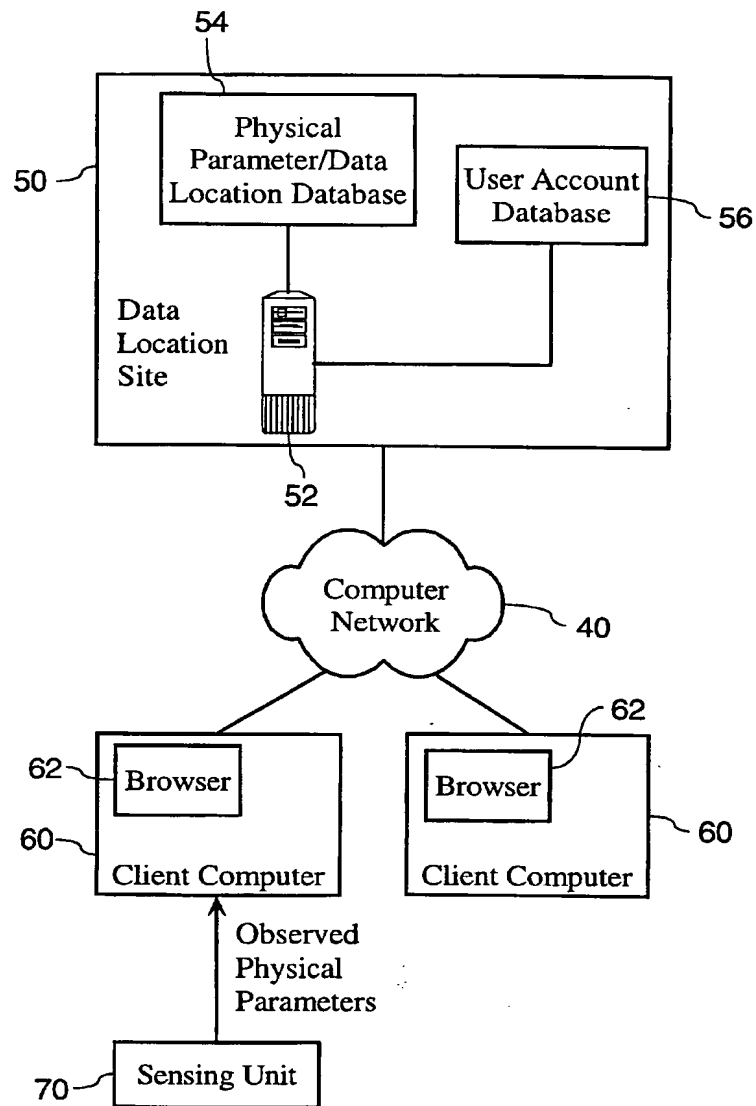


FIG. 6

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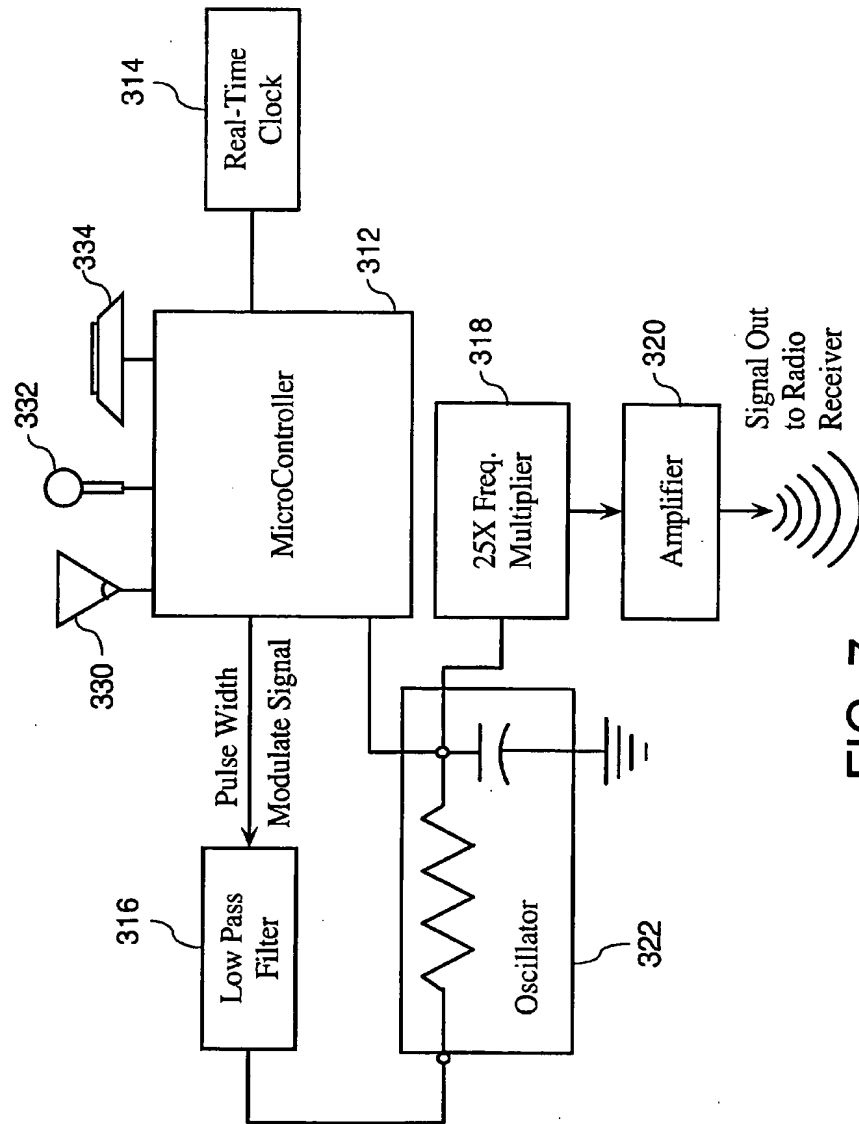


FIG. 7

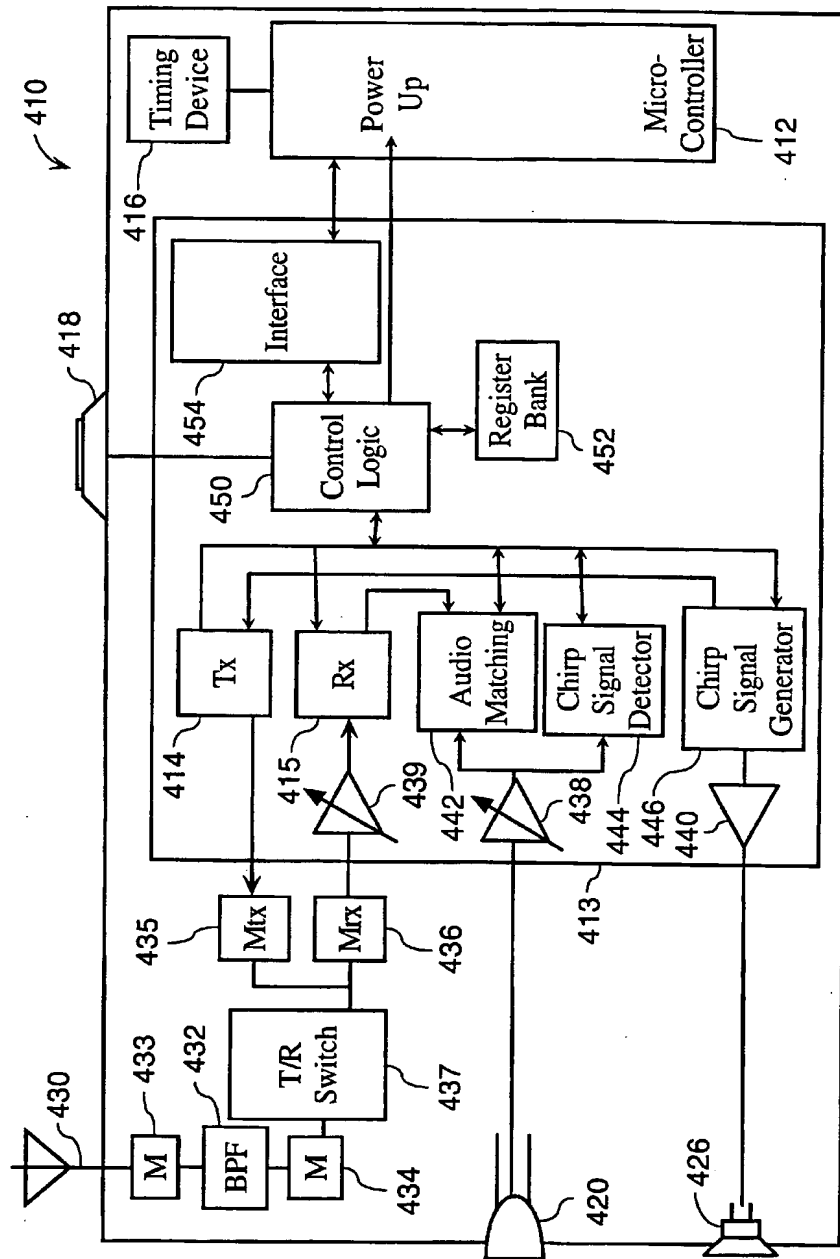


FIG. 8

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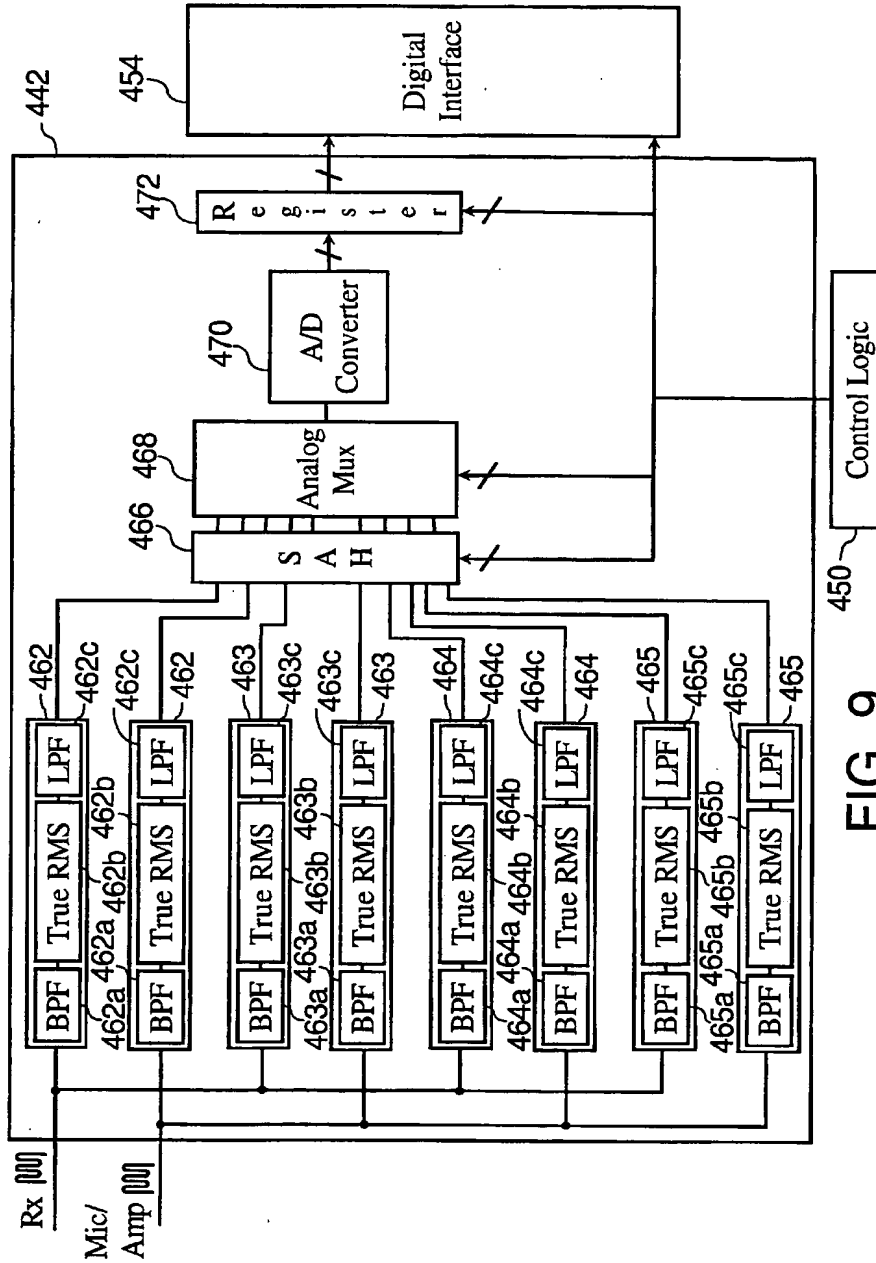


FIG. 9

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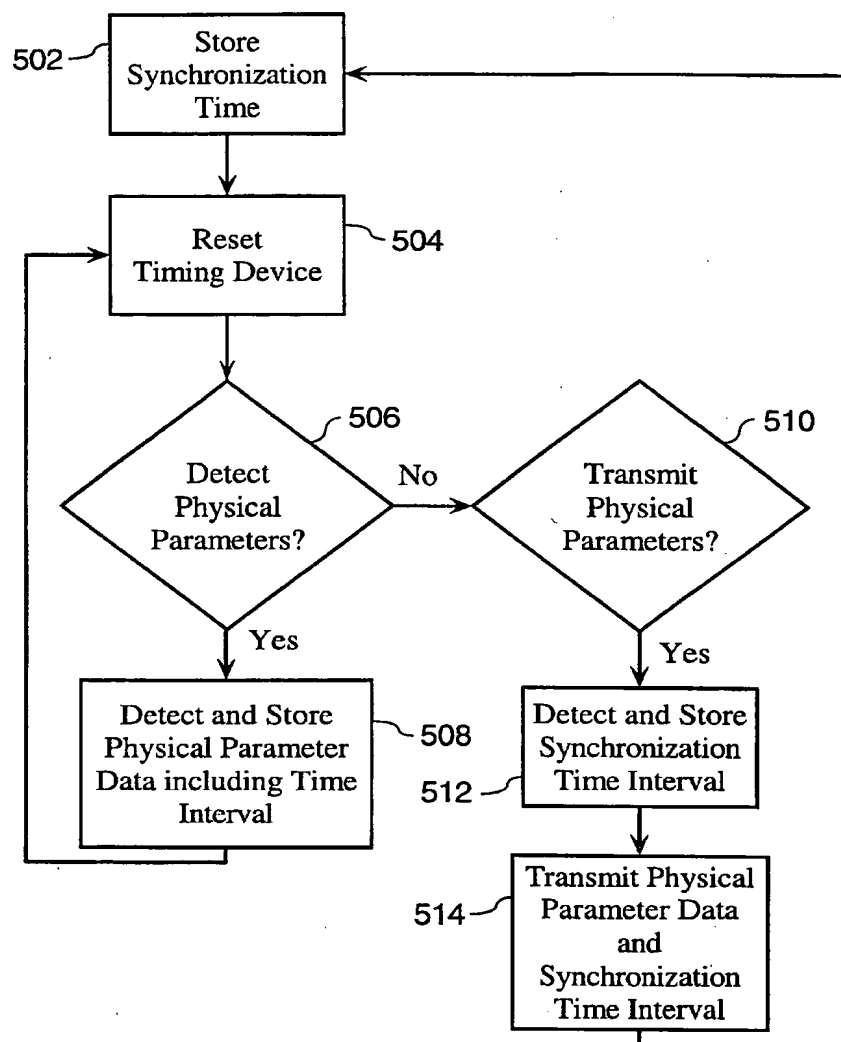


FIG. 10

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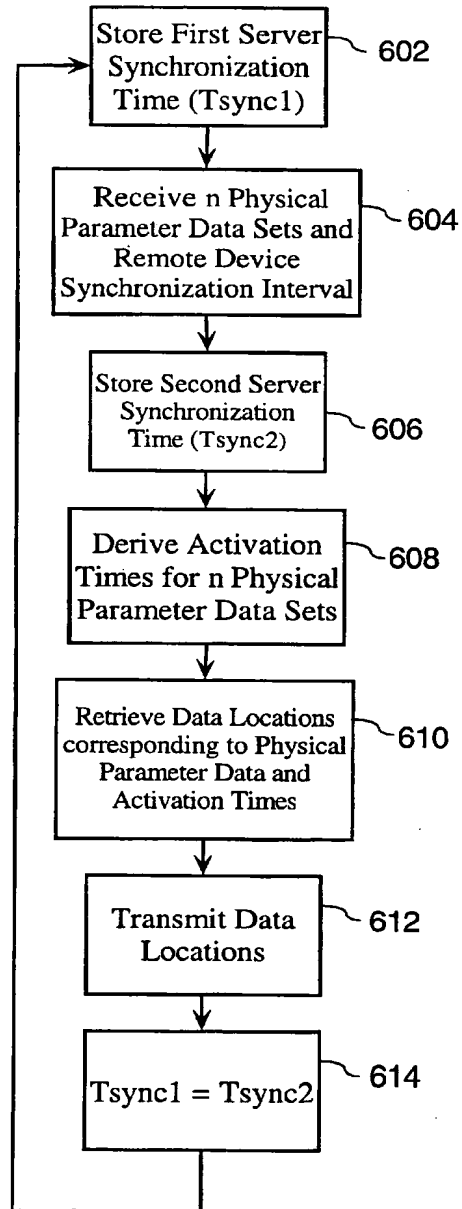


FIG. 11

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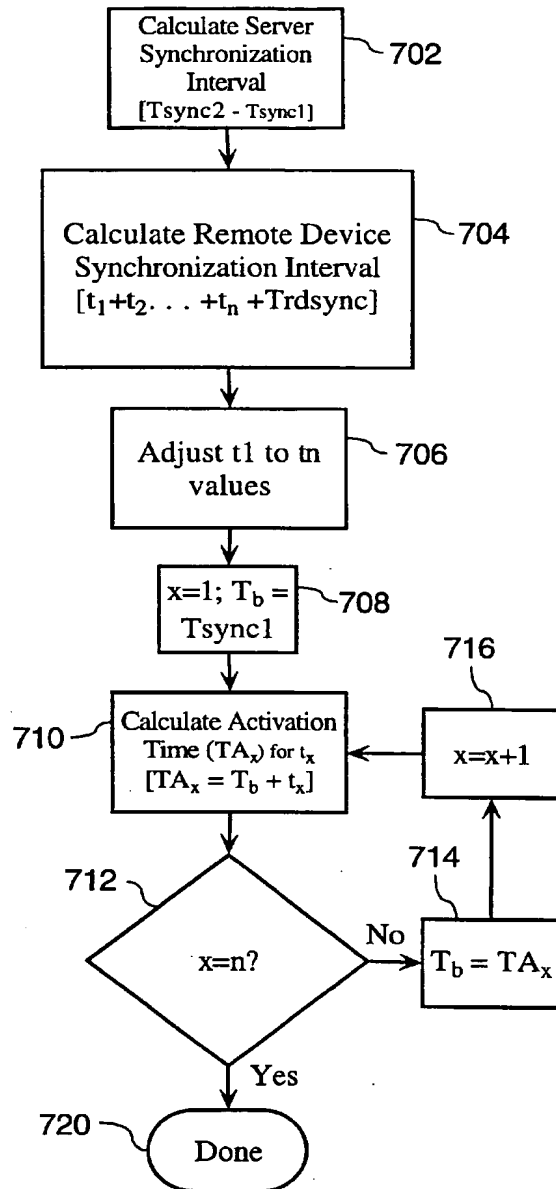


FIG. 12

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